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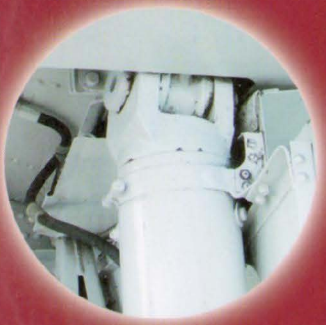
TOPSHOTS

TBM-3 Avenger

Tom Żmuda • Leszek A. Wieliczko



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Tom Żmuda,
Leszek A. Wieliczko

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GENERAL MOTORS (EASTERN) TBM-3

Avenger

In 1939 the Bureau of Aeronautics specified requirements for a new US Navy carrier-borne torpedo bomber. In April 1940 two competing designs were accepted for further development – XTBF-1 by Grumman and XTBU-1 by Vought. Shortly afterwards, two prototypes of each of the two designs were ordered. Since the XTBF-1 was slightly lighter, had better range and a smaller span with folded wings, it was duly proclaimed the winner of the contest and in December 1940 the first order for serial production was placed.

The XTBF-1 prototype was first flown on 7th August 1941. After the Japanese attack on Pearl Harbour the new aircraft was christened "Avenger". The first serial TBF-1s were delivered to the US Navy in January 1942. The new bomber made its debut in small numbers during the famous Battle of Midway in June 1942. The production figures quickly soared and soon the already out-dated Douglas TBD-1 "Devastator" was phased out in favour of the new design. In 1942 an agreement was struck with the Eastern Aircraft Division of the General Motors Company to enable the company to build the Avenger under license. The GM production Avengers were designated TBM. Apart from TBF/TBM-1 and -1C sub-variants, one more version, TBM-3, was pressed into service by the end of the WWII. More specialized variants followed afterwards. All in all, 9839 Avengers of all sub-types were built, including as many as 7546 manufactured by General Motors.

From mid-1942 on, TBF/TBM Avenger was the primary carrier-borne US Navy bomber in the Pacific Theatre of Operations. It also played a vital role in hunting the German U-boats in the Atlantic. The aircraft was also successfully deployed in neutralizing ground targets during the American amphibious operations. Initially the aircraft mainly served as a bomber as the American torpedoes of that time proved very faulty. Not before the mid-1944 – after introducing substantial improvements in torpedo designs – was this weapon re-deployed in the battlefield. By then, the Avenger ordnance also featured depth charges and rocket missiles.

Avenger was one of the best carrier torpedo bombers of World War II. It was the first American carrier-based bomber fitted with a bomb bay and the first American aircraft sporting the electrically-driven gun turret. Throughout the war Avenger served with US Navy, US Marine Corps, the British Fleet Air Arm and the Royal New Zealand Air Force. It stayed with US Navy until 1954. After the war Avengers were also used by Canada, France, Netherlands, Uruguay, Brazil, and... Japan.

Leszek A. Wieliczko

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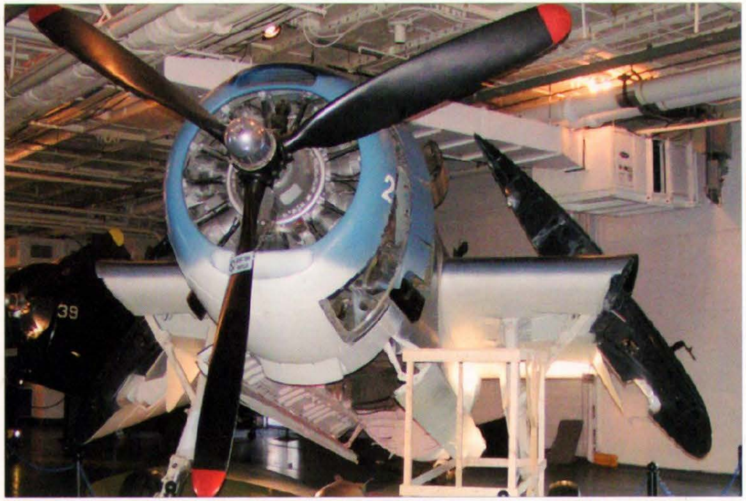
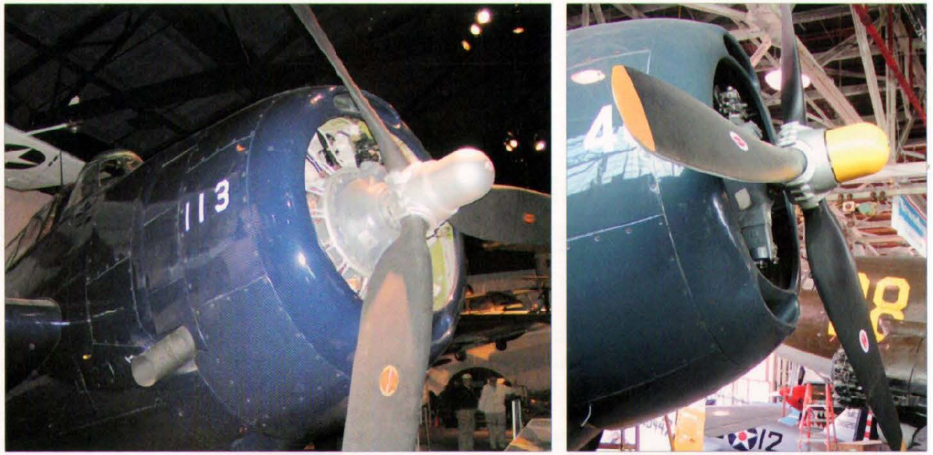
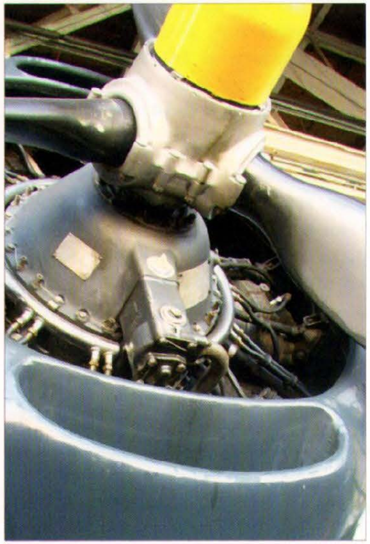
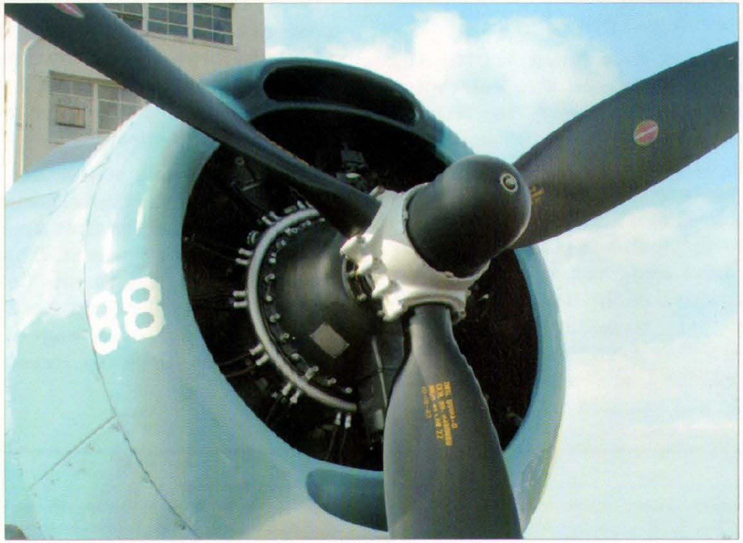


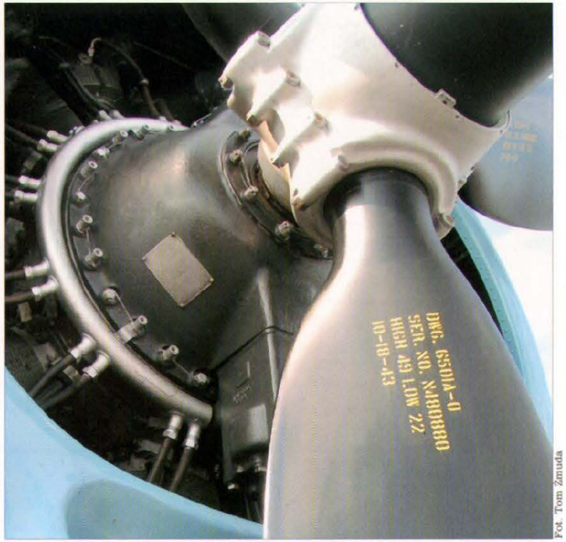
TBM-3 with folded wings and an open weapons bay • TBM-3 ze złożonymi skrzydłami i otwartą komorą bombową



Fourteen-cylinder radial engine Wright R-2600, fitted with a 4.0 m diameter 3-bladed variable-pitch Hamilton Standard Hydromatic propeller. Note the carburettor air intake mounted directly above the engine, and the oil cooler air intake in the lower lip • Silnik Wright R-2600 ze śmigłem Hamilton Standard Hydromatic







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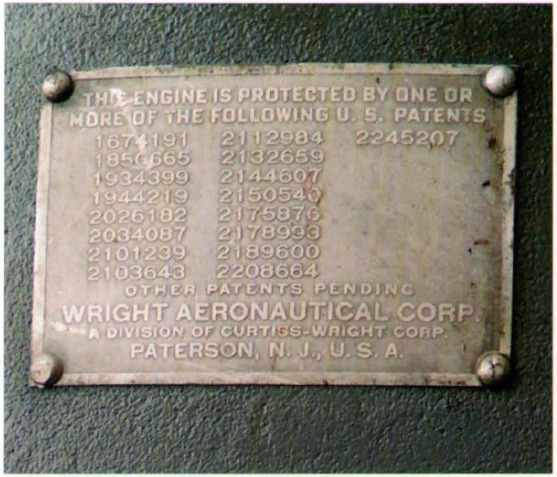
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MORE OF THE FOLLOWING U. S. PATENTS
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OTHER PATENTS PENDING
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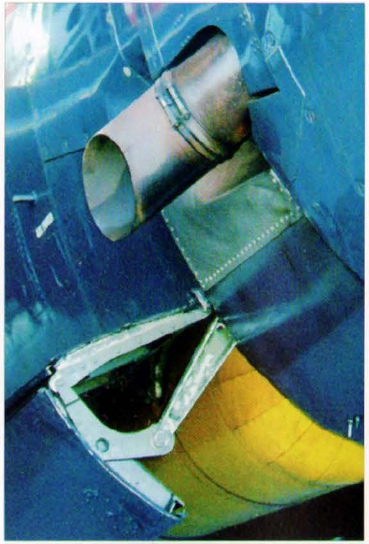

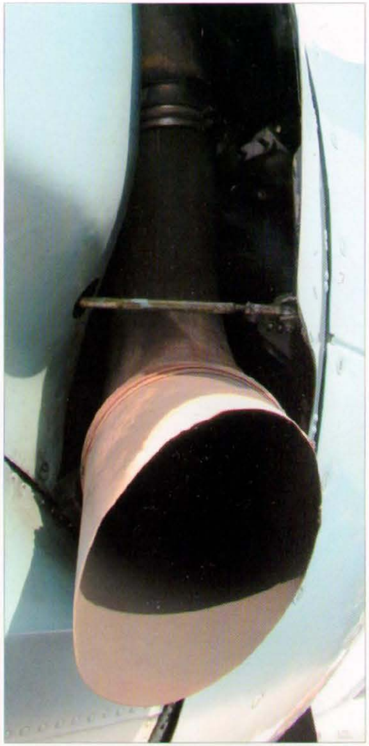

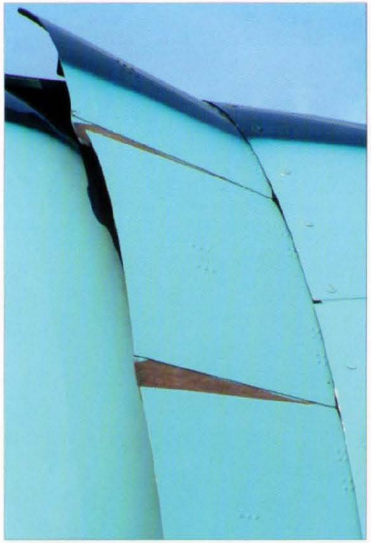

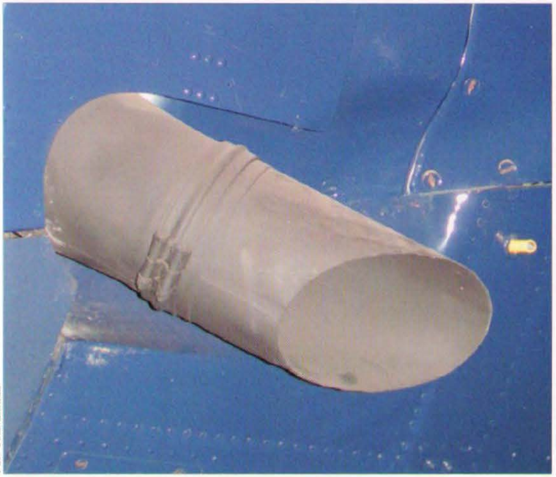

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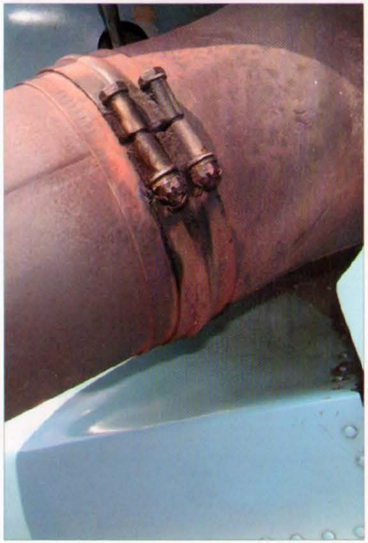
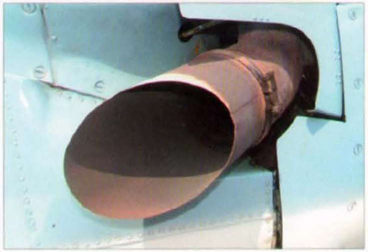
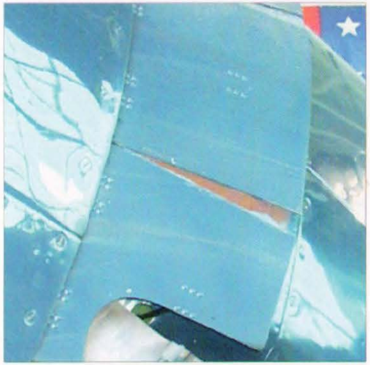
Portside exhaust tube, fastened to the end of the exhaust collector by a bracing band with two screws which tightened it around the pipe • Rura wydechowa z lewej strony kadłuba

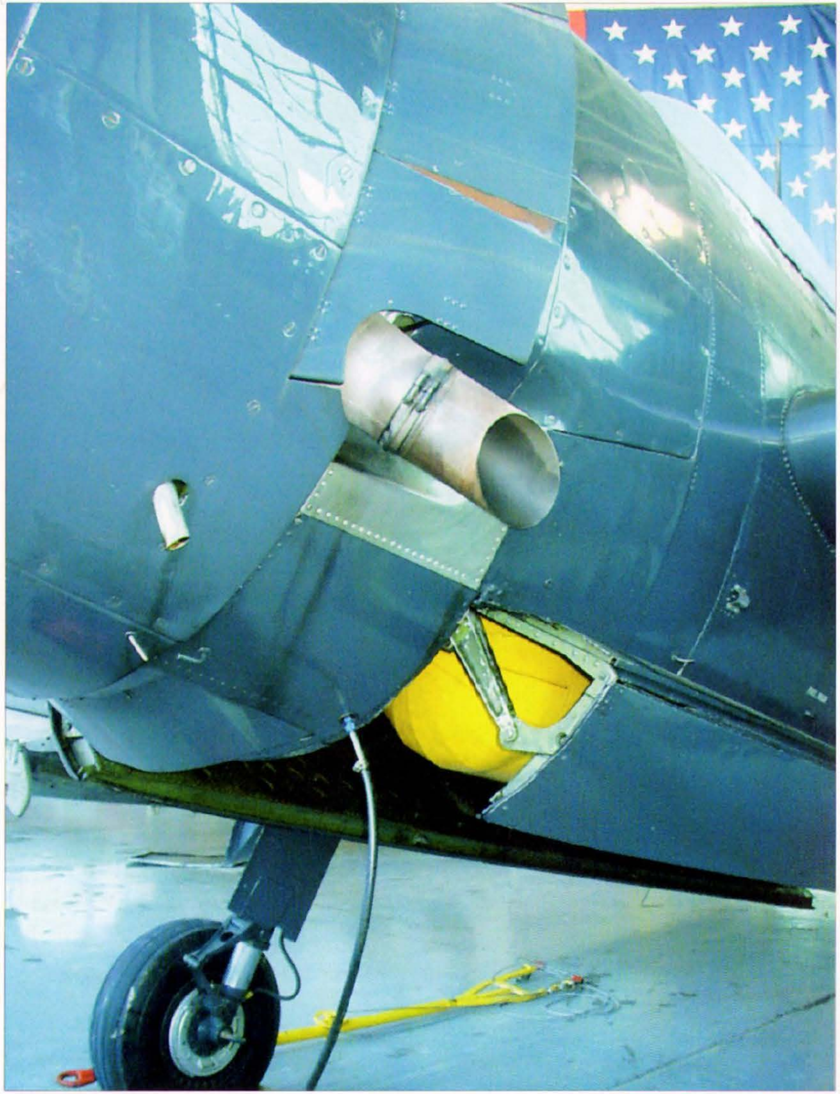


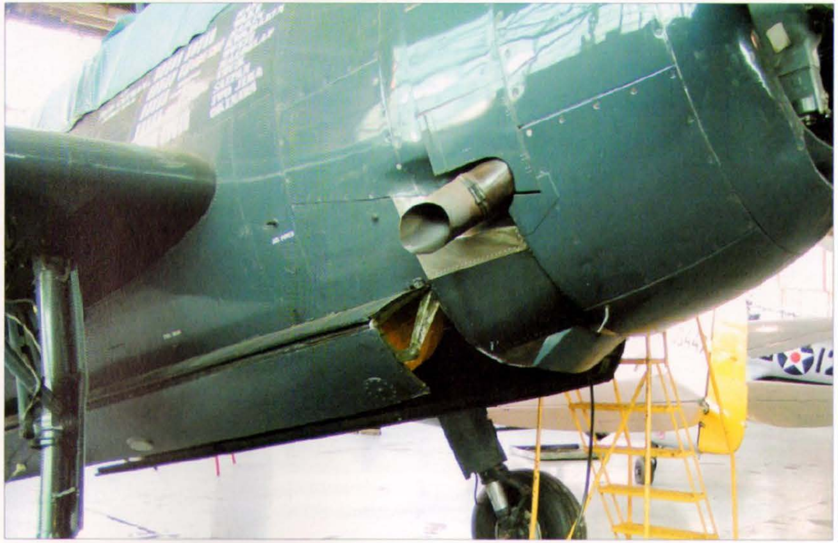


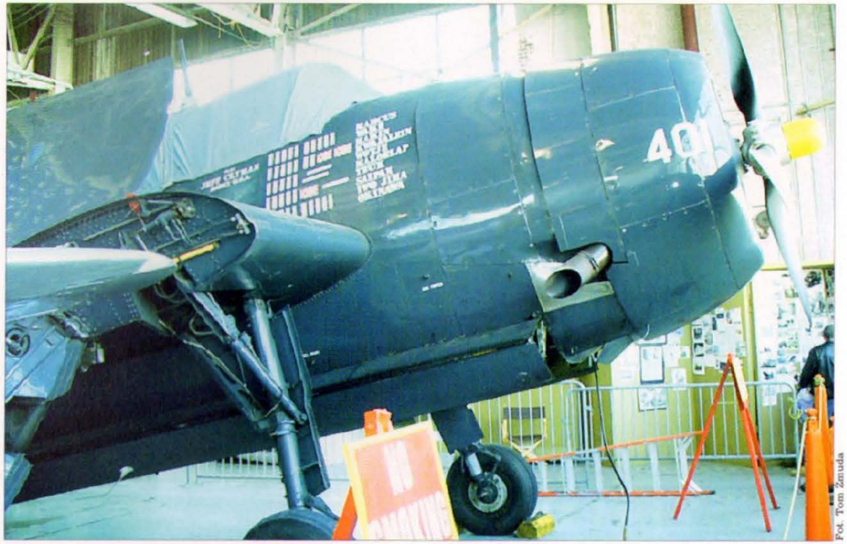
Starboard exhaust tube; of note are details of the mechanism controlling the bomb bay doors • Rura wydechowa z prawej strony kadłuba



Close-up of cowl flaps. Starting from TBM-3 sub-variant, four of such cowls were fitted on each side of the engine. These could be set in three positions: closed, open, and intermediate, and were operated by means of three separate pushers • Klapki żaluzji chłodzących silnika







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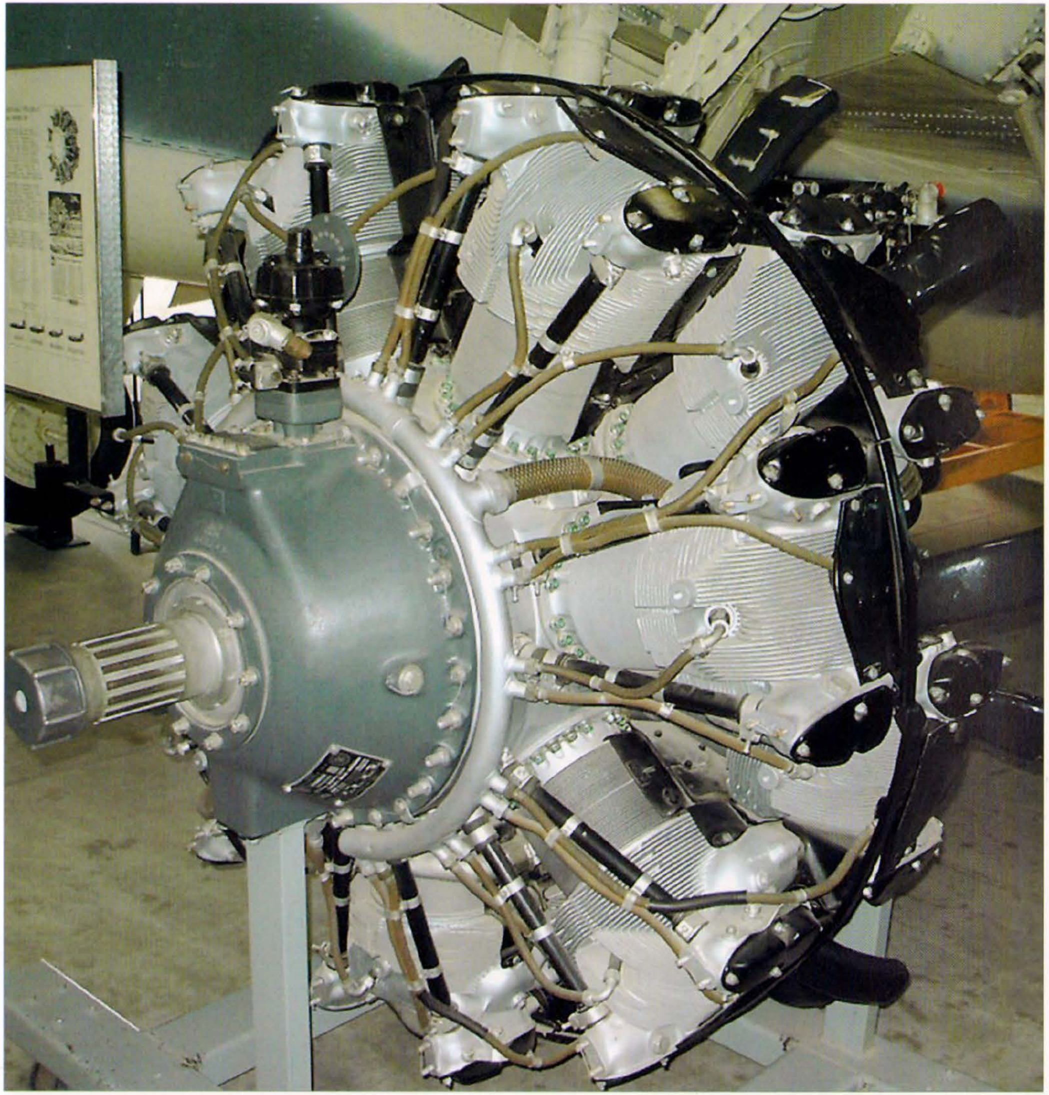
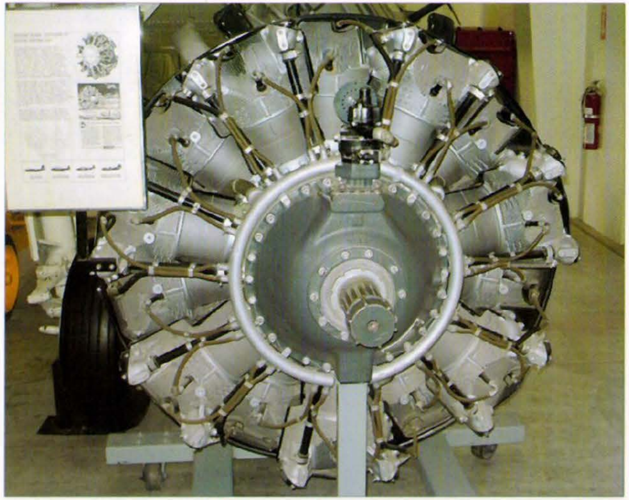
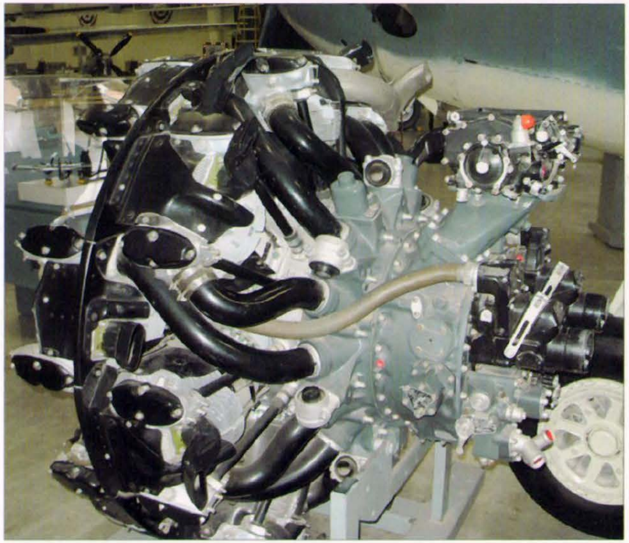
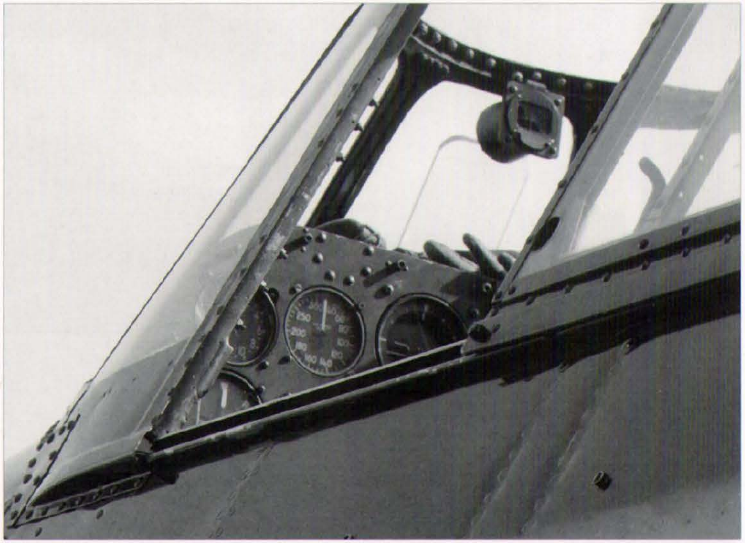


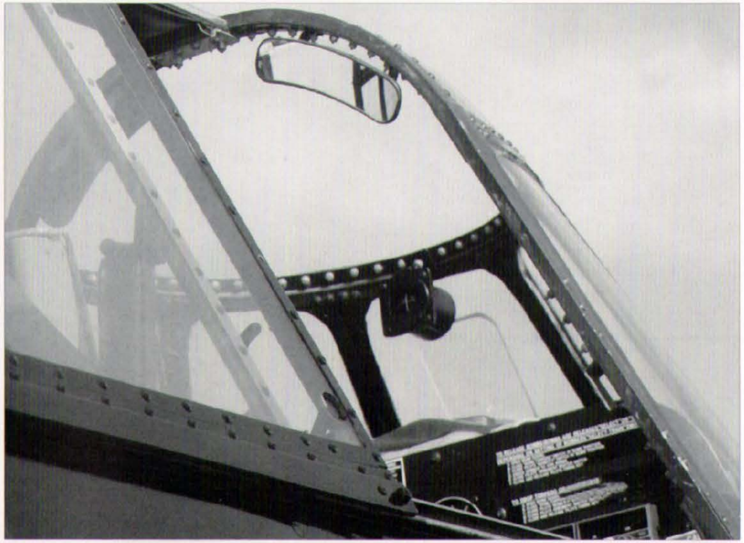


Fourteen-cylinder radial engine Wright R-2600 • Czternastocylindrowy Silnik Wright R-2600 (fot. Mark Beckwith)

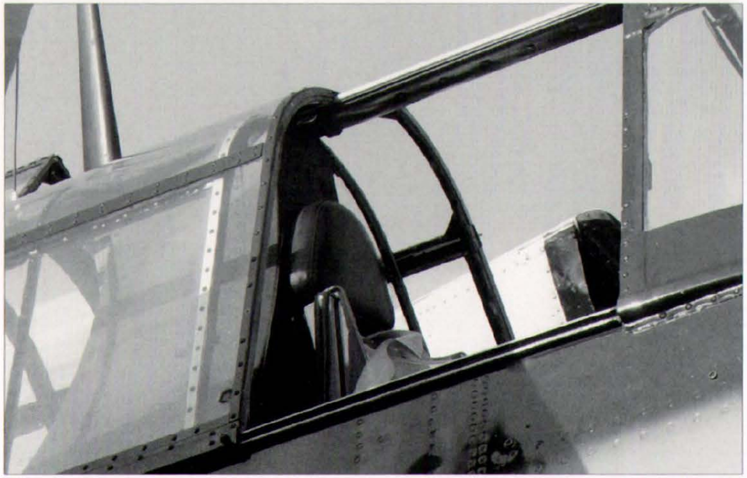




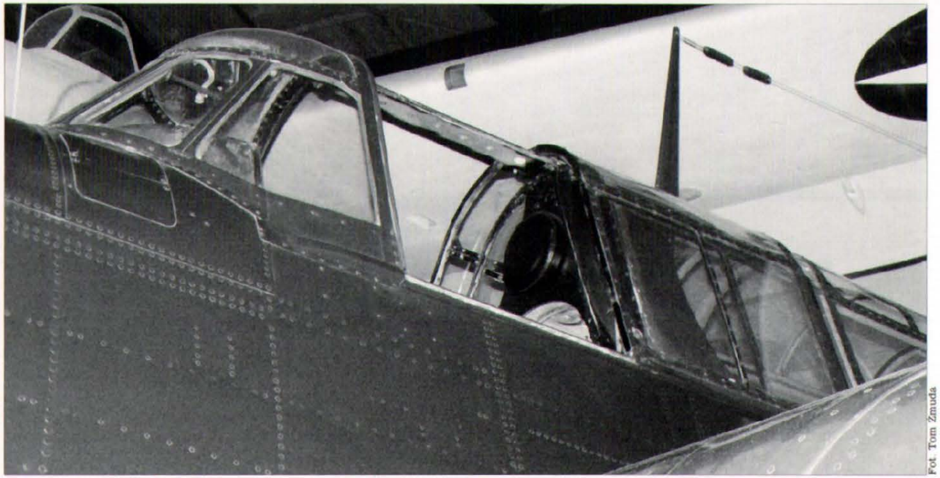
The portside view on the windshield. Note the Mark 8 reflector gunsight and the magnetic compass suspended from the windshield framing • Wiatrochron kabiny pilota z lewej strony



The starboard side view of the windshield. Rear-view mirrors mounted on the upper framing are clearly visible • Wiatrochron kabiny pilota z prawej strony

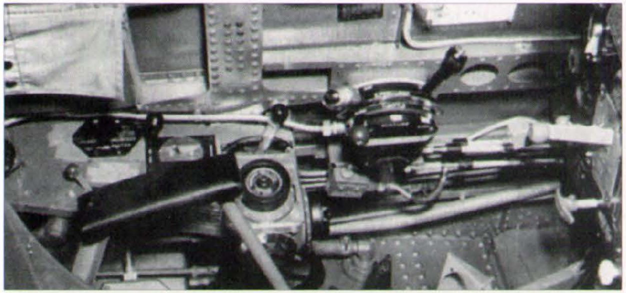


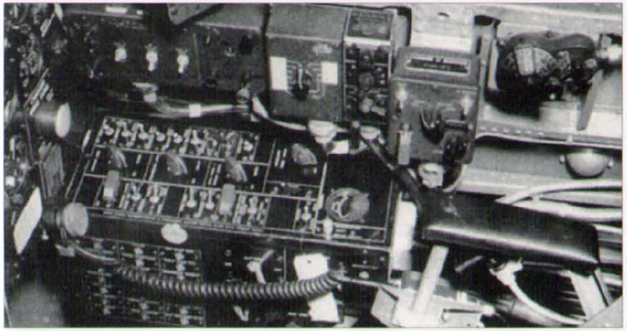
Portside view of the cockpit. The sliding parts of the canopy could be blocked in several positions: fully-open, closed, or in three intermediate positions. All the canopy panels were made of Perspex • Kabina pilota z prawej strony

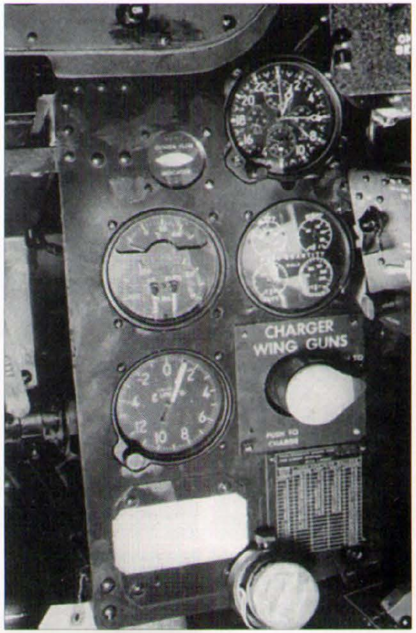


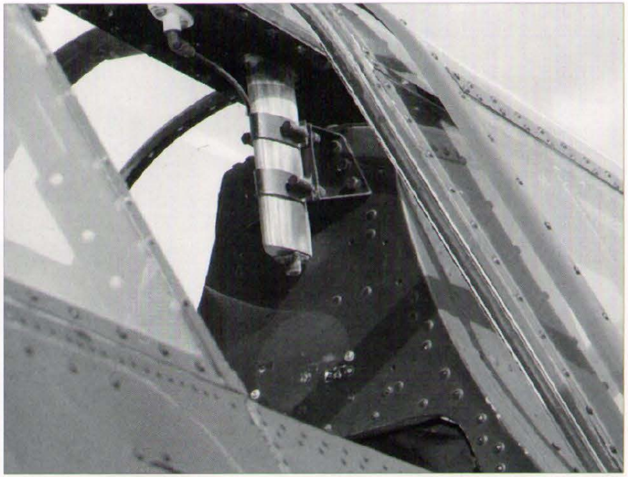
Fot. Tom Zmuda

The cockpit with both side covers slid rearward. The armour plate shielding the pilot's back was 0.275 inch (9.5 mm) thick, whilst the part protecting his head was 0.75 (19.1 mm) thick • Kabina pilota z odsuniętymi do tyłu obiema częściami

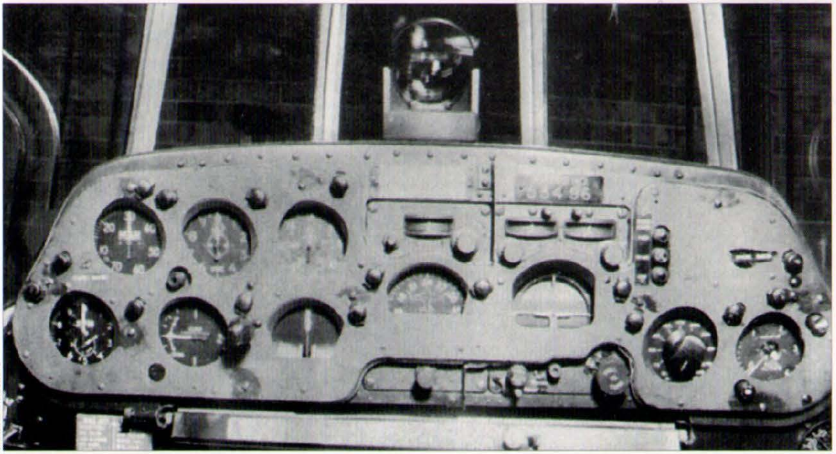






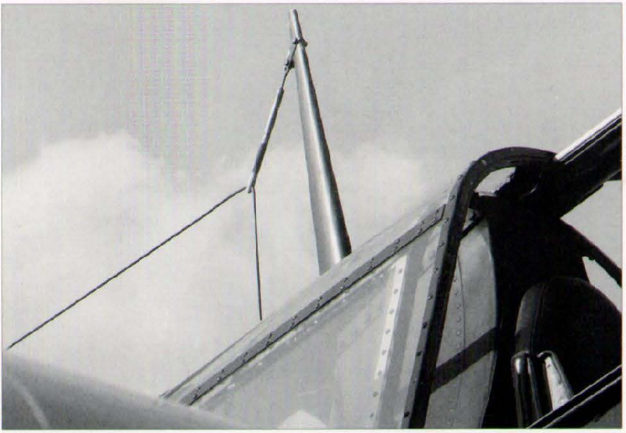


Radio-operator cockpit, starboard side, rear view. Note the mountings of the VHF radio set type AN/ARC-1 antenna mast • Widok od tyłu z prawej strony na kabinę radiooperatora



National Archive

Instrument panel in TBM-3 pilot's cockpit, the port side and starboard side of pilot's cockpit, starboard auxiliary panel. Interior of TBM-3 pilot's cockpit • Wnętrze kabiny pilota TBM-3 (National Archives)



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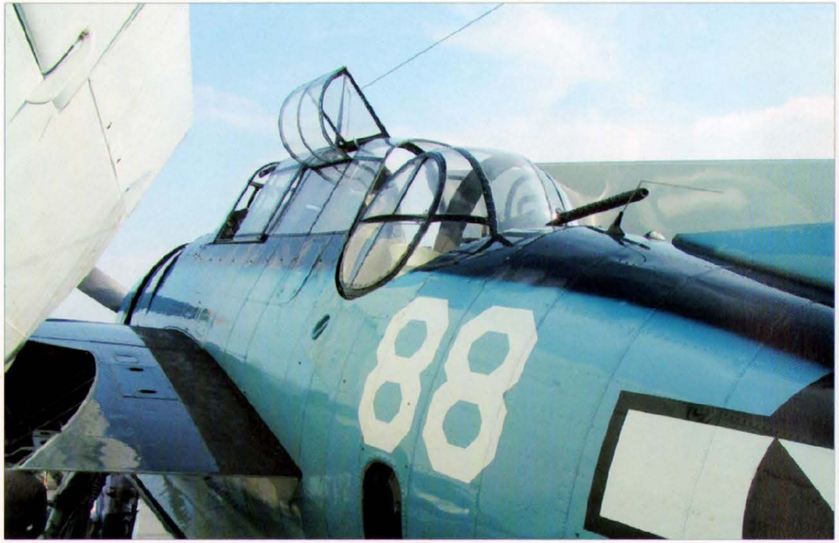
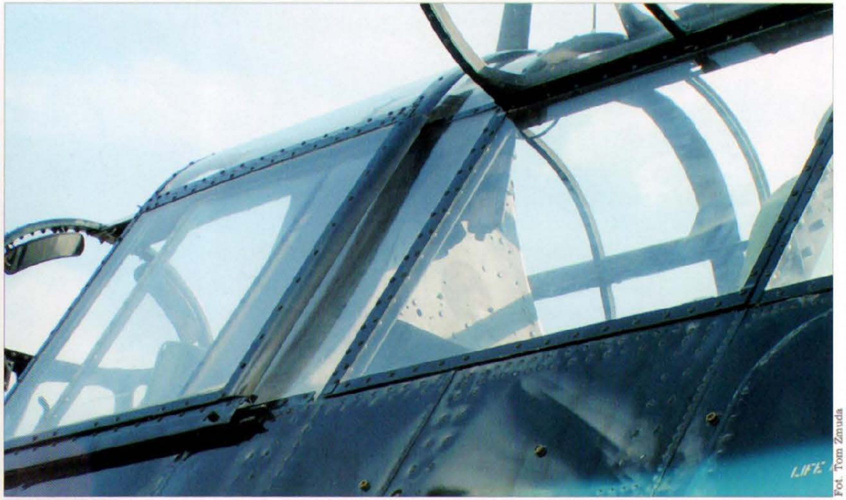
Antenna mast on top of the canopy, as seen on this museum TBM-3. In real life, a single aerial was stretched between a mast on the canopy and a short mast on top of the tail. From there, another wire linked a short horizontal bracket on the port side of the cockpit • Maszt antenowy TBM-3





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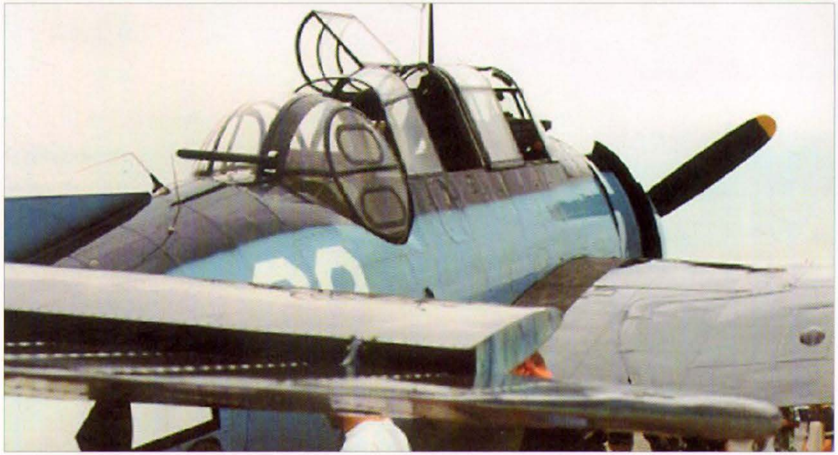
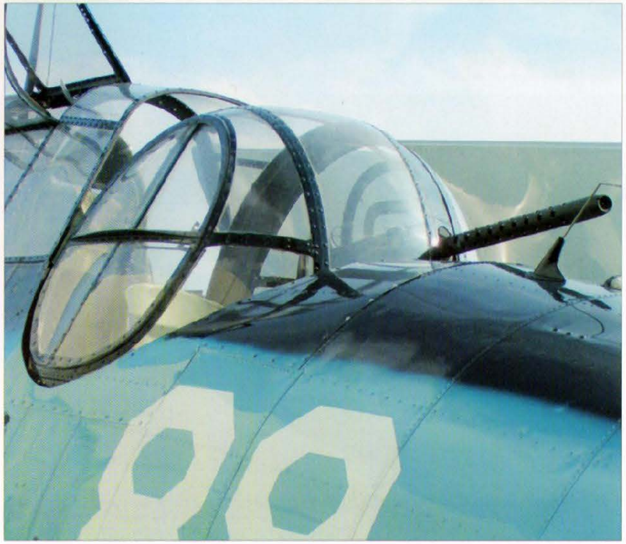
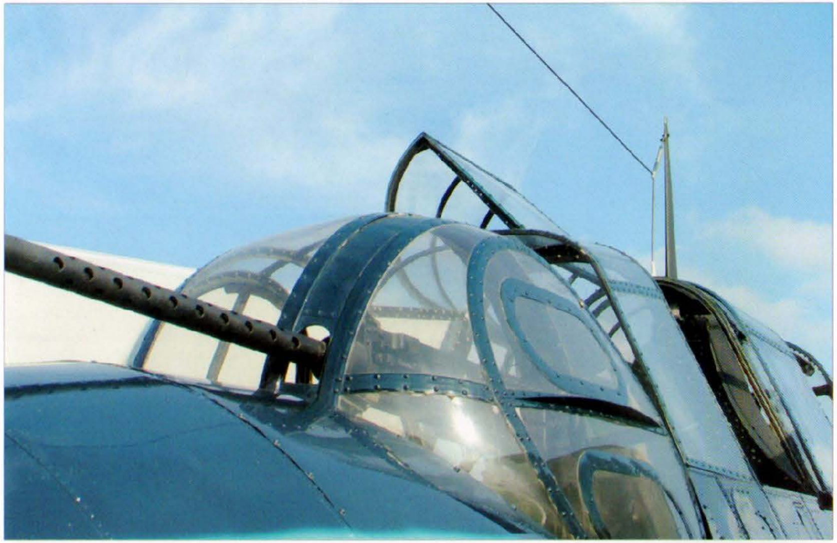
Middle section of the cockpit, portside, rear view. Note the strengthened anti-nose-over frame between the pilot and the radio-operator seats • Środkowa część osłony kabiny

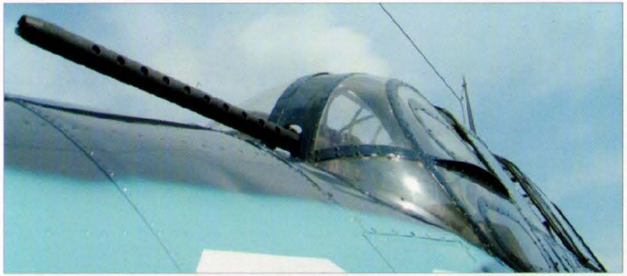


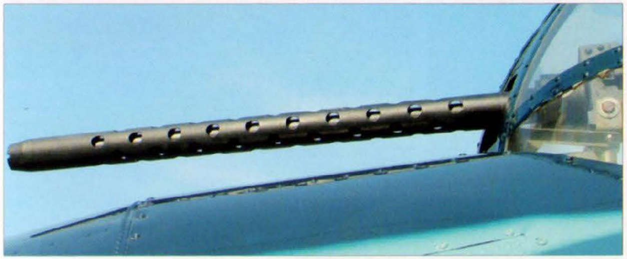
The pilot's canopy was sliding rearwards (left and right side independently), while the radio operator's compartment canopy had a hinged roof (open to port) with the right-hand square side panel folded inside the roof. The radio operator and the gunner climbed aboard the aircraft through a door in the aft starboard part of the fuselage • Kabina pilota



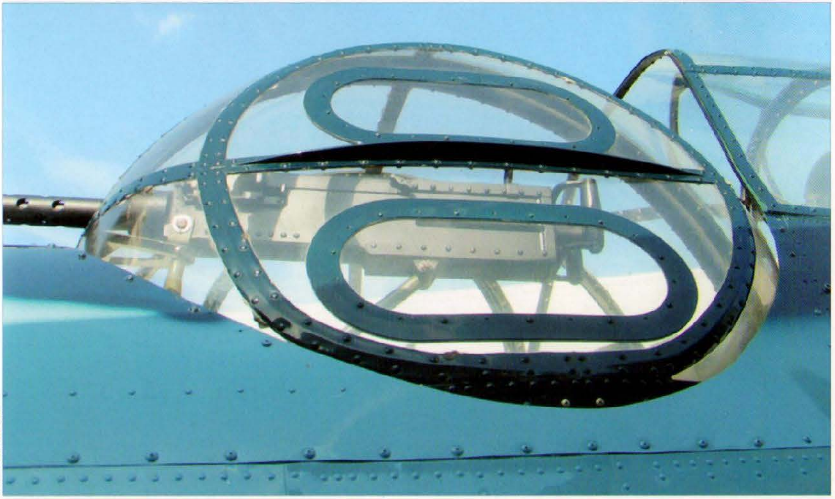
Gunner turret, Grumman 150SE type. It was electrically driven, the first of its type mounted on an American aircraft. It was able to rotate both sides full 360°. The flat round panel on the side of the turret could be jettisoned and served as an emergency exit for the gunner • Wieżyczka strzelecka Grumman 150SE







Colt-Browning M2 12.7 mm cal. machine gun, mounted in the dorsal turret. The gun was set off to the left side of the gunner's position and the fuselage longitude axis. It was belt-fed from an ammunition box of 200 rounds, with another box of the same capacity in store. The gun's vertical elevation range was –30/+85° • Karabin maszynowy Colt-Browning M2 12,7 mm



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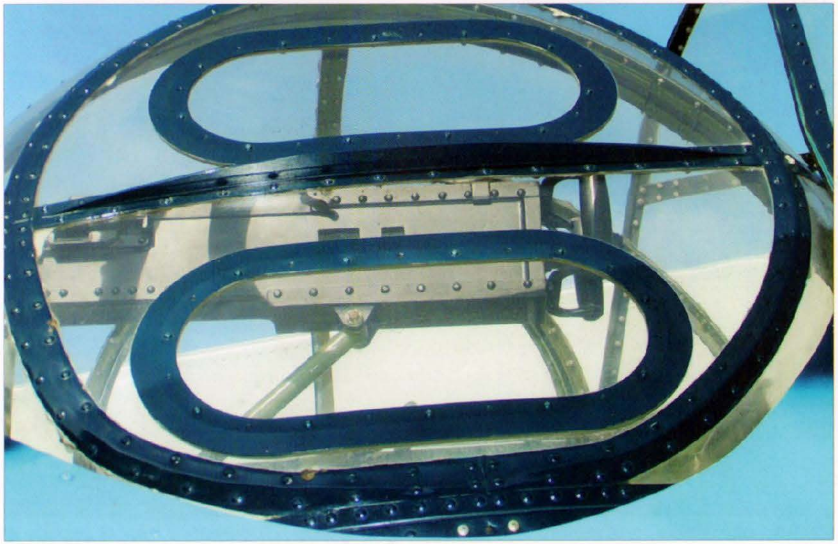
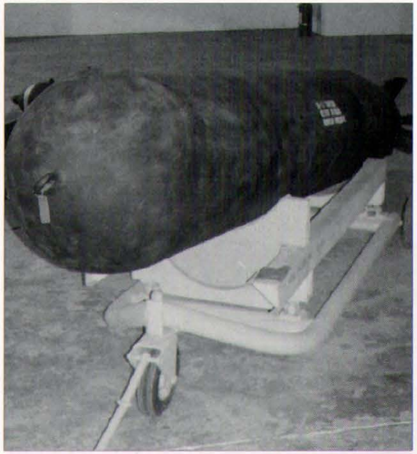
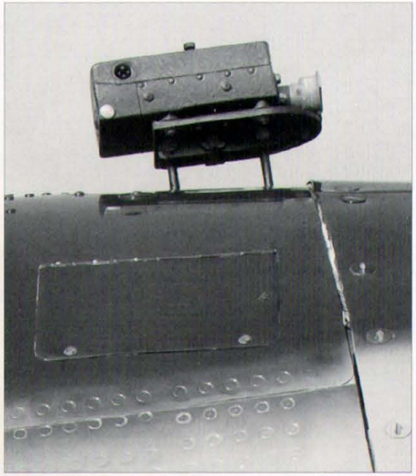
Starboard side view of the turret with two elongated panels • Prawa strona wieżyczki strzeleckiej

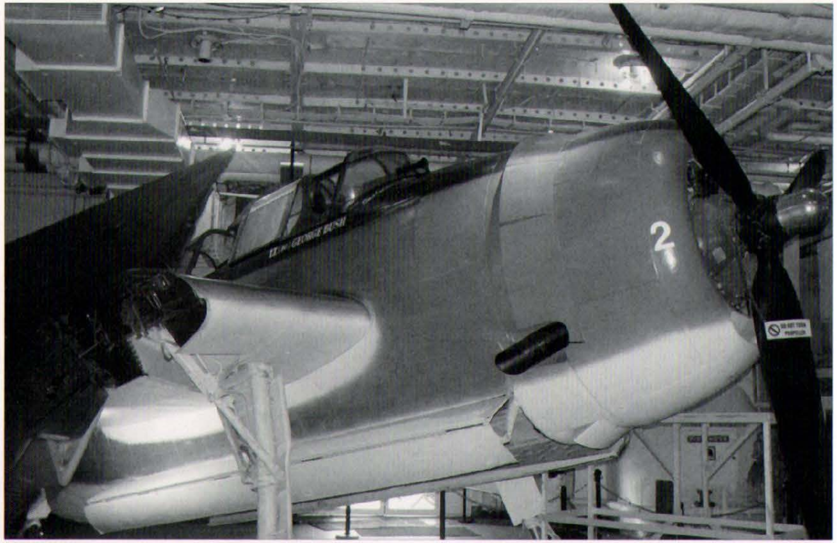


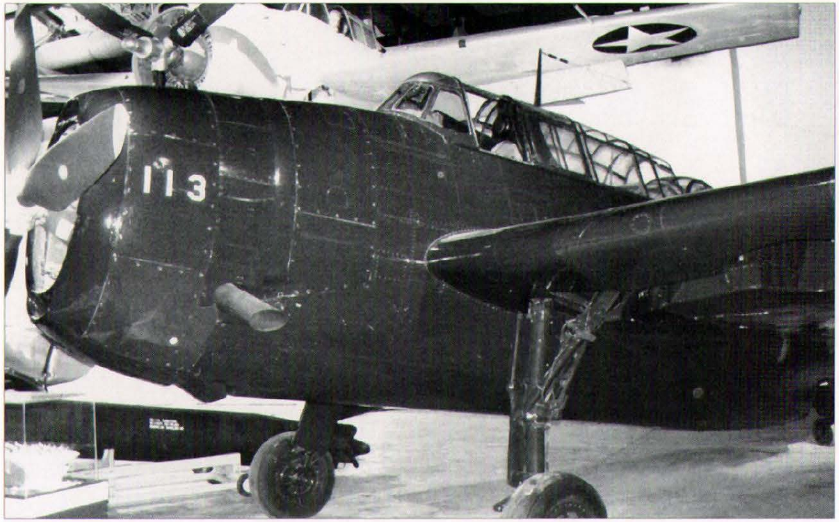


22.4 (569 mm) cal. torpedo, Bliss-Leavitt Mk 13 type. Depending on the version, its weight ranged from 874 to 1005 kg • Torpeda Bliss-Leavitt Mk 13 kalibru 22,4 cala (569 mm)

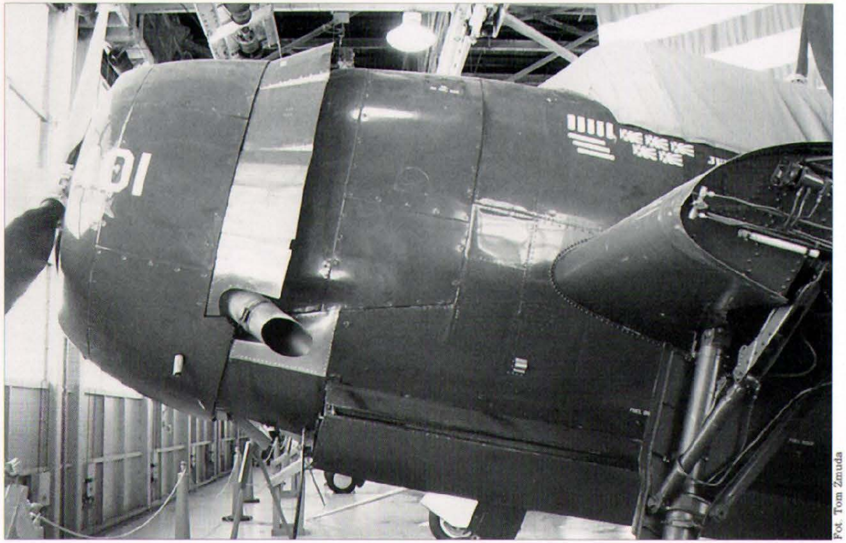


Gun camera of AN-N6 type, mounted in front of the windshield, rarely used in combat • Fotokarabin AN-N6





TBM-3E on display in museum • Muzealne egzemplarze TBM-3E



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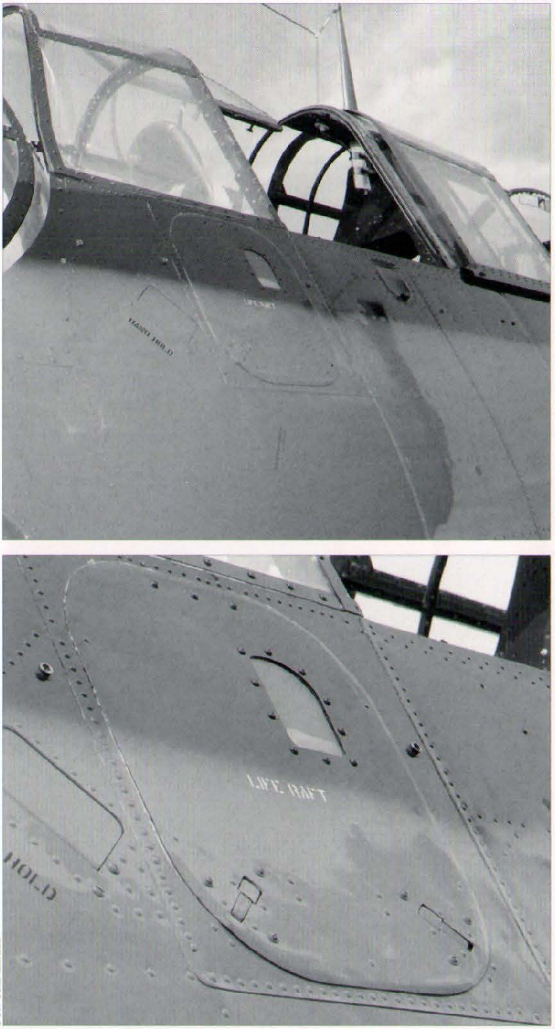

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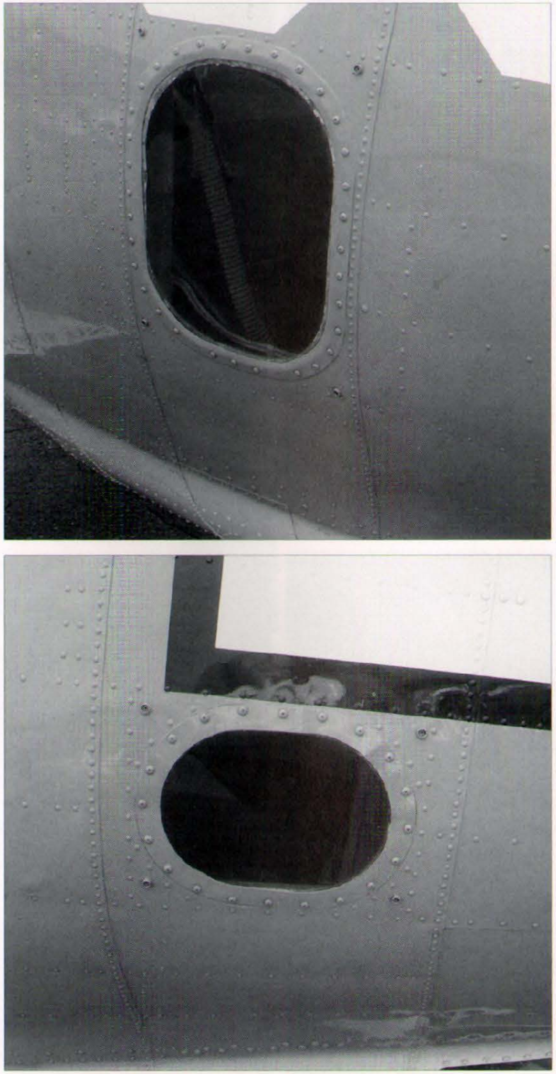
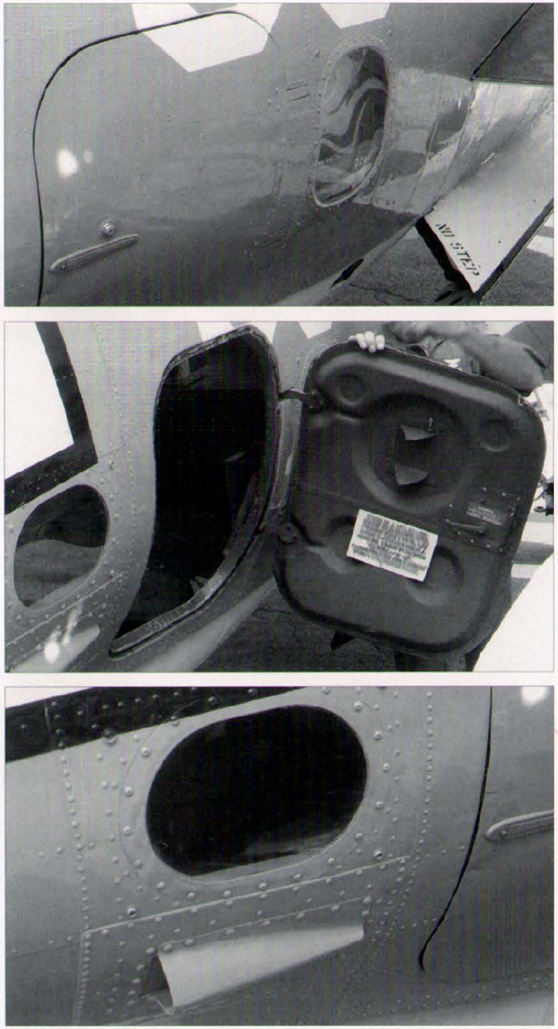
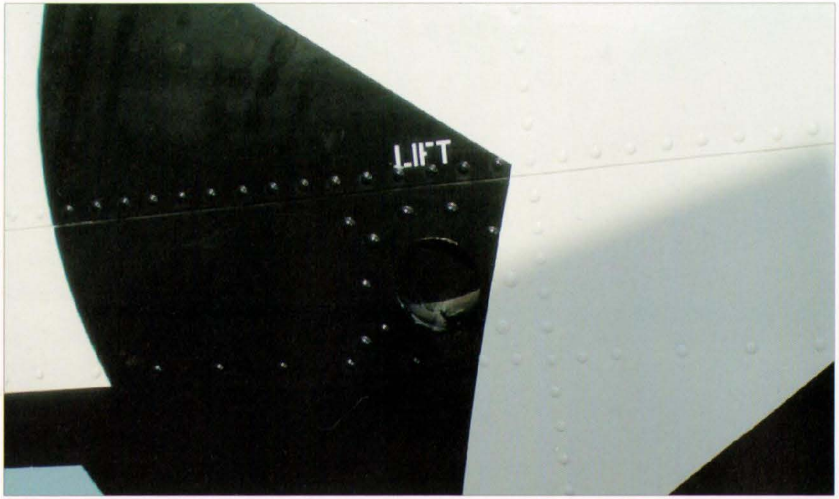
A hatch to where an inflatable life raft Mark 4 Type D was stowed. The compartment was also accessible from the port side • Pokrywa luku tratwy ratunkowej Mark 4 Type D



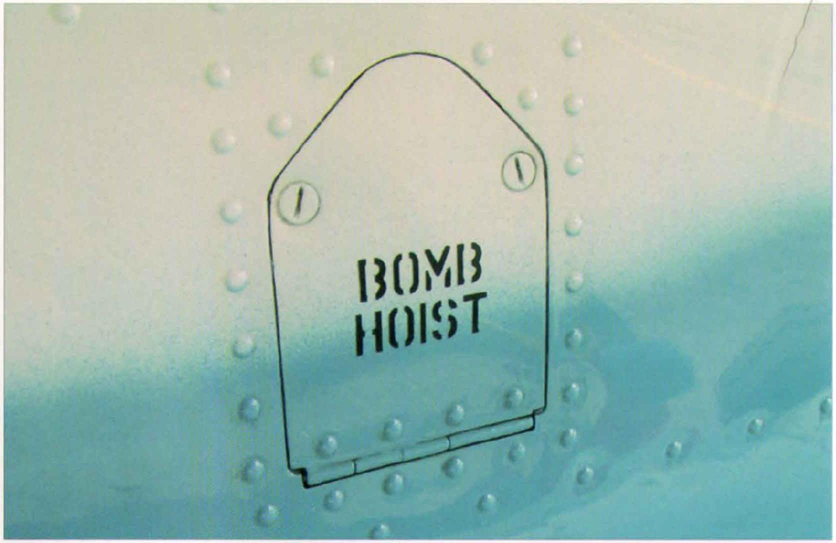
Port side windows • Okienka z lewej strony kadłuba

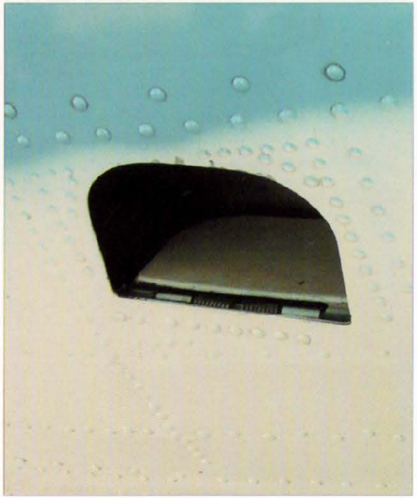


The area of ventral gunner position. Note the door for the radio operator and the gunner, as well as the oval-shaped side widow • Dolne stanowisko strzeleckie

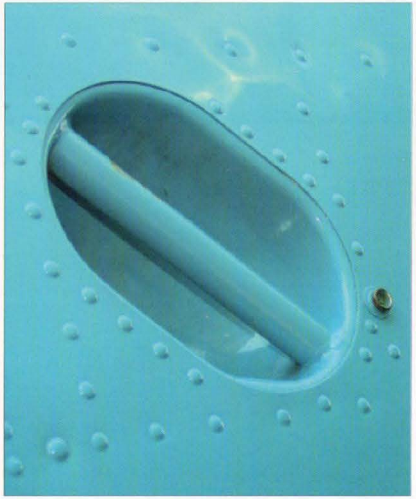


An opening in the aft fuselage (on each side), which served as an attachment point for lifting the aircraft • Otwór w tylnej części kadłuba służący do podnoszenia tyłu samolotu

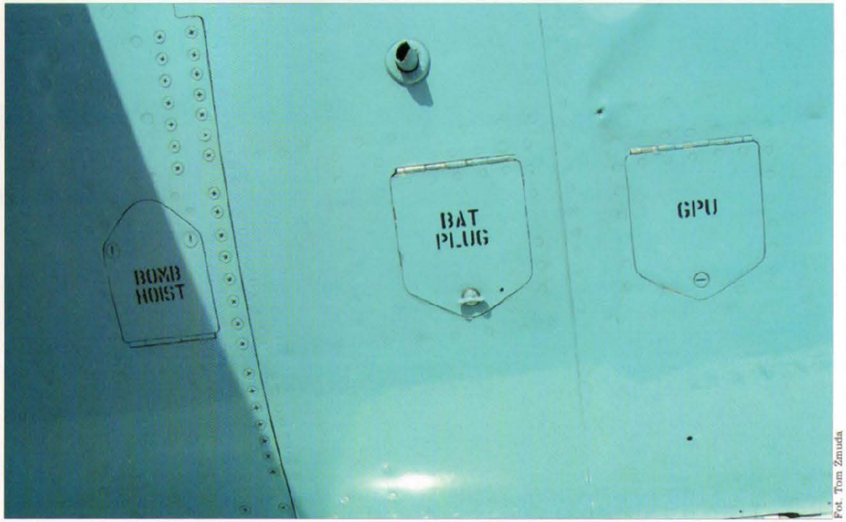




Starboard entry foot hold • Stopień wejściowy z prawej strony kadłuba

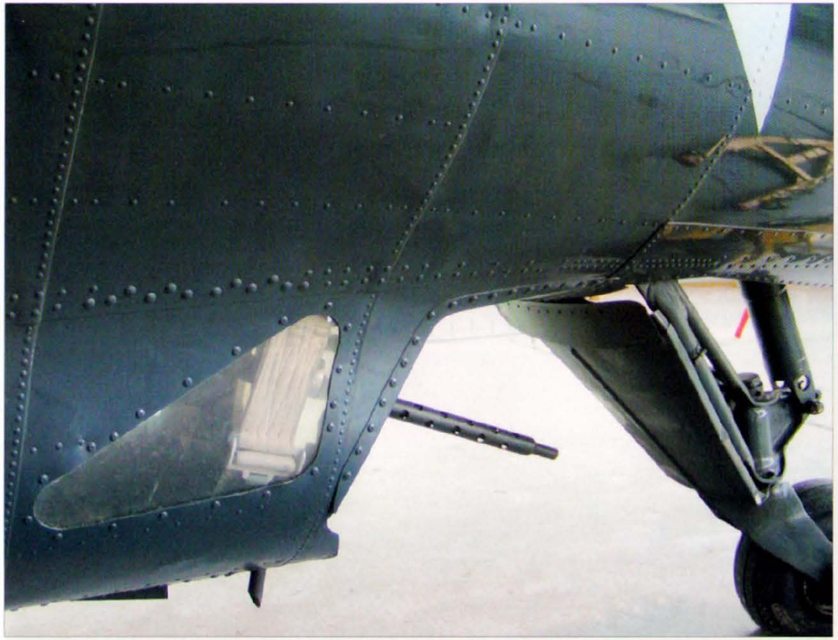


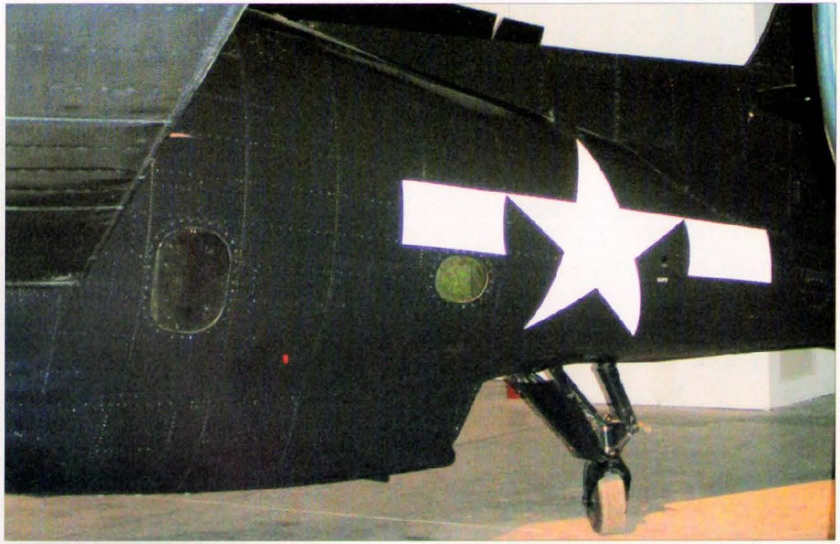
Starboard side cockpit entry hand holds • Uchwyty wejściowe z prawej strony kadłuba

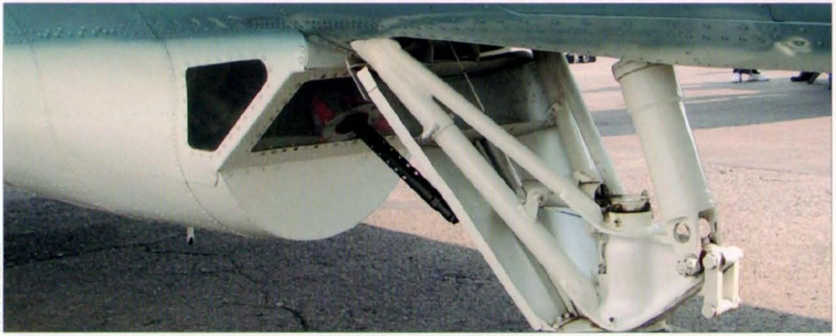


Fot. Tom Zmuda

Starboard maintenance hatches • Klapki serwisowe z prawej strony kadłuba

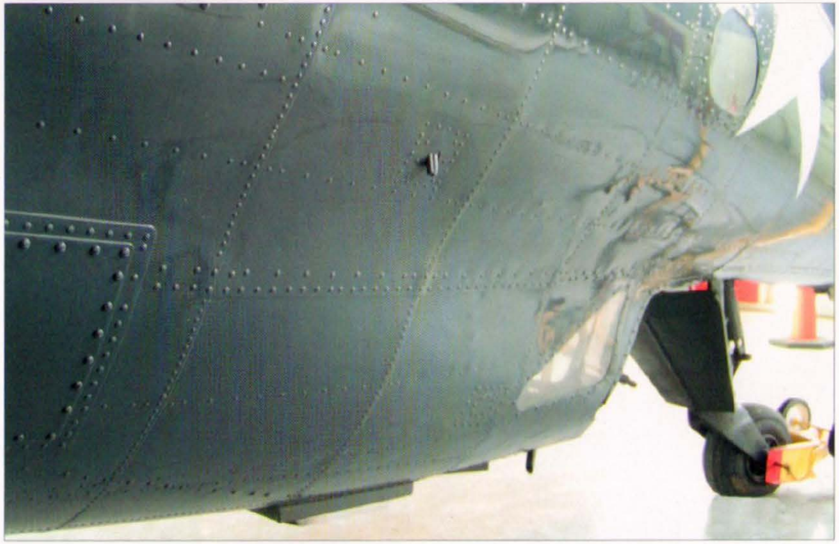


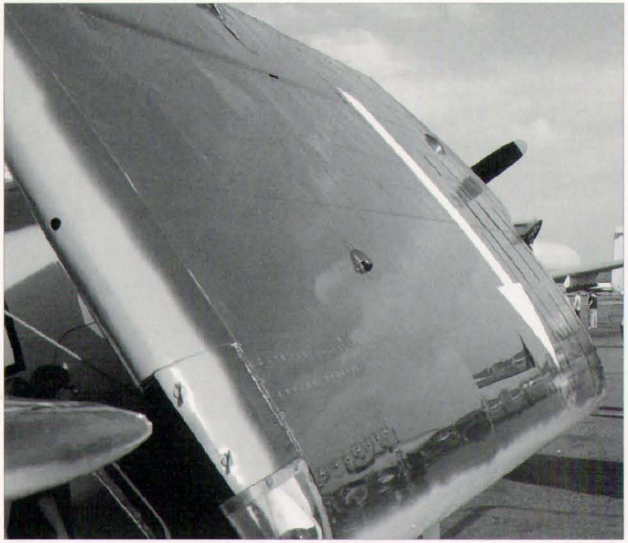


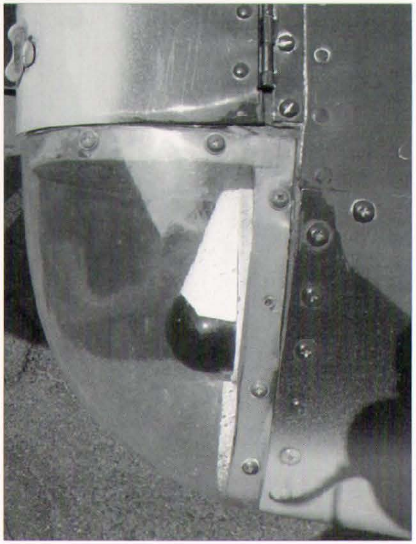


Fot. Tom Zmuda

Aft fuselage, port side. Visible are the ventral gunner position with the barrel of the Colt-Browning 7.62 mm gun and the tail wheel. From TBM-3E sub-variant on, the ventral gunner position was dropped, albeit re-created in many aircraft on display in museums • Tył kadłuba z lewej strony – stanowisko dolnego strzelca oraz lufa karabinu Colt-Browning kalibru 7,62 mm

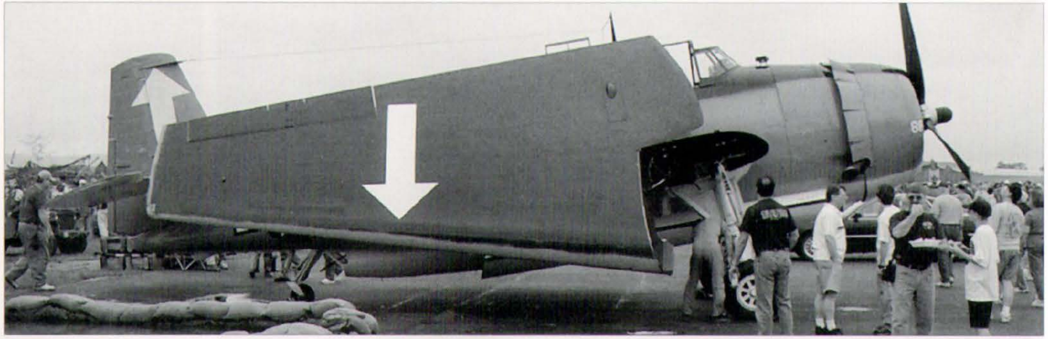


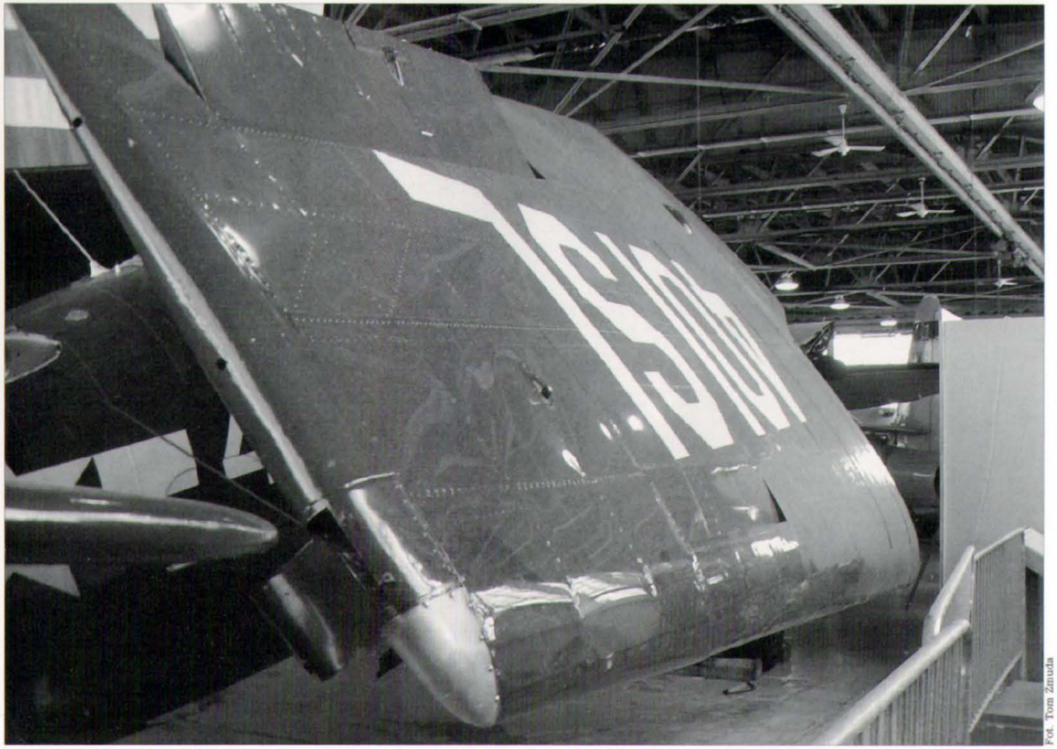




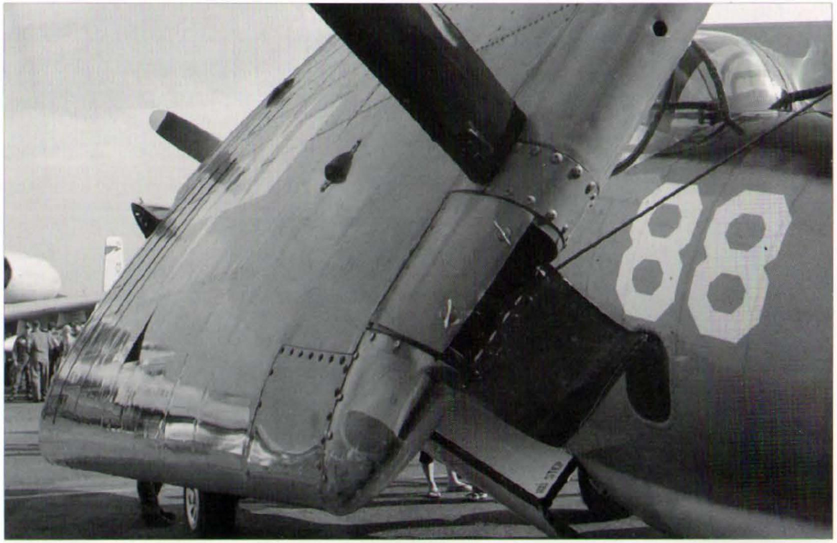
Starboard wing folded • Złożone prawe skrzydło

The green navigation light on the tip of the starboard wing • Zielone światło nawigacyjne na prawym skrzydle

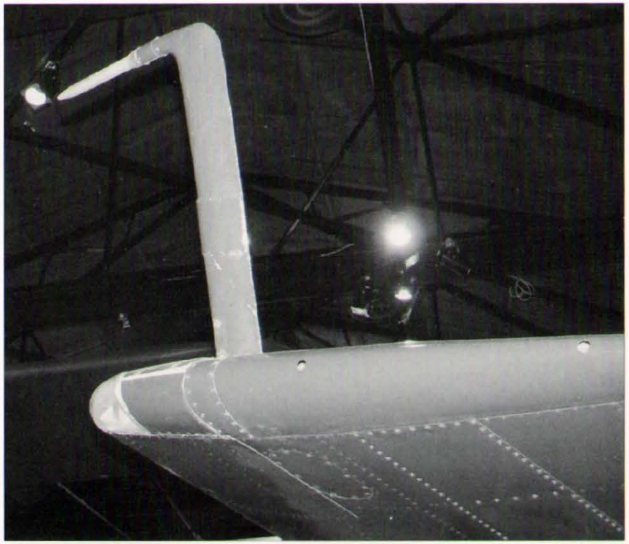


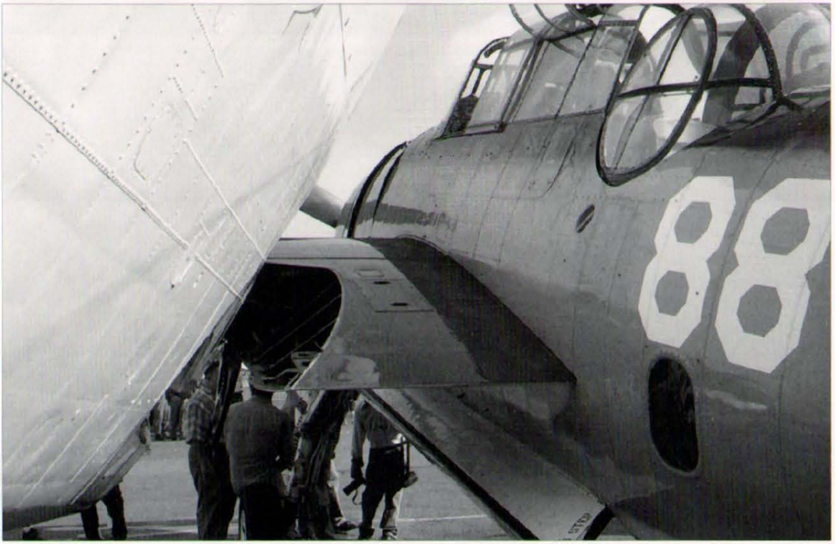


Fot. Tom Zmuda



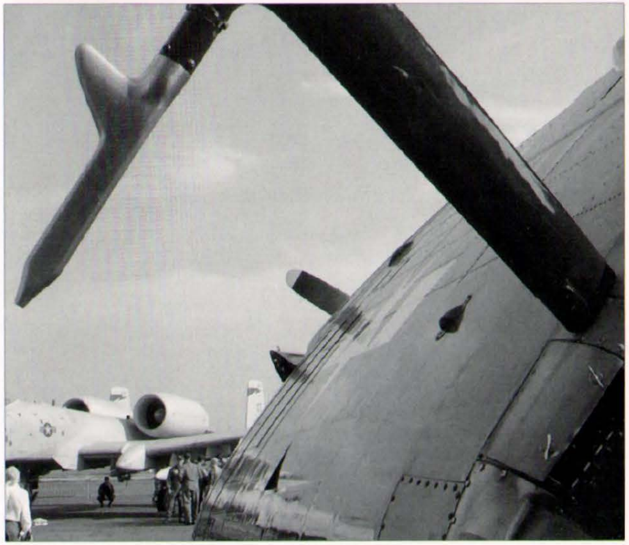
Port wing folded. Note the steel cord linking the tip of the folded wing with the tailplane • Złożone lewe skrzydło

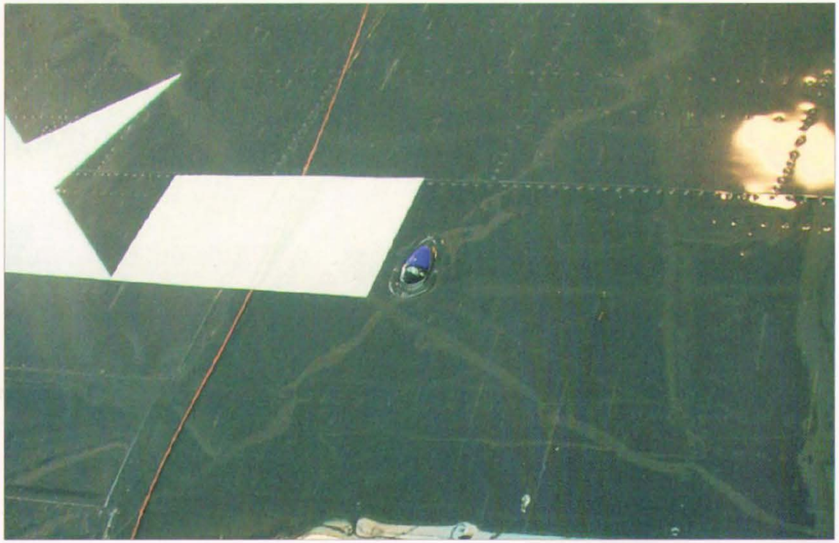




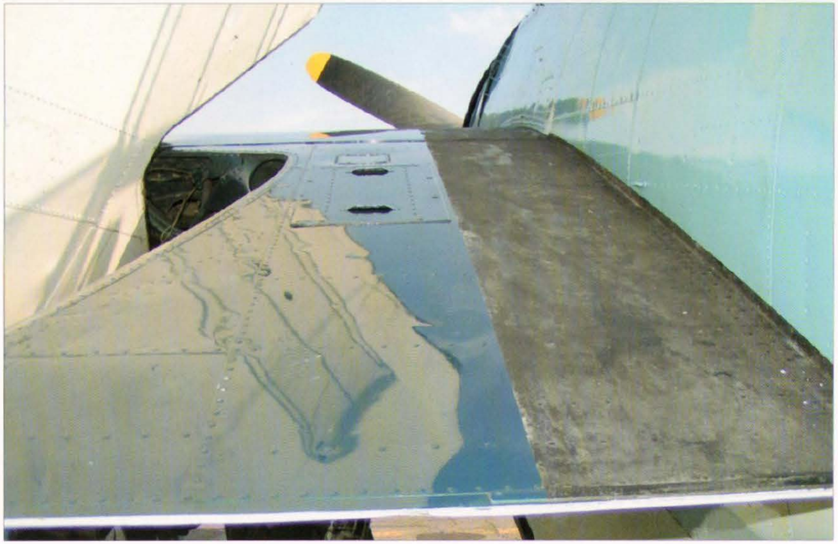
Fot. Tom Zmuda

Pitot tube on the tip of the port wing • Nadajnik prędkościomierza (rurka Pitota)

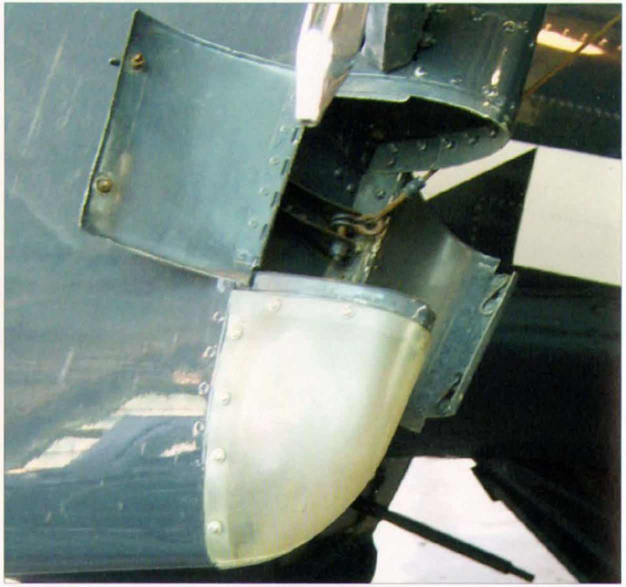




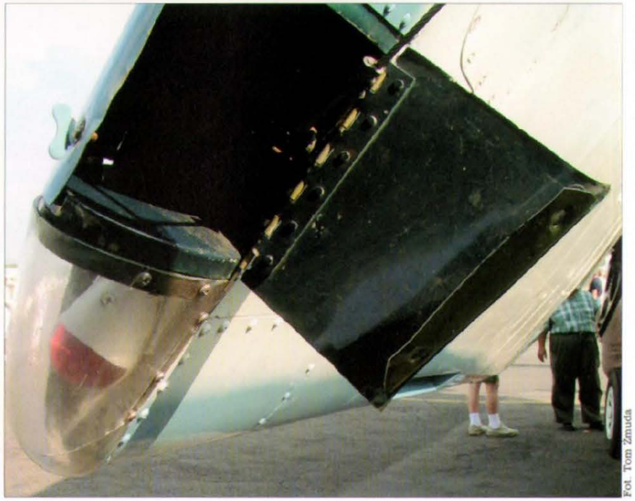
Blue formation light on the upper port wing • Niebieskie światło identyfikacyjne na lewym skrzydle



Anti-slippery walkway over the port wing root • „Chodnik" przeciwpoślizgowy na lewym skrzydle



Red navigation light on the tip of the port wing. Note the open hatch and the cord securing the folded wing to the 'ear' mounted on the leading edge of the tailplane • Czerwone światło nawigacyjne na końcówce lewego skrzydła



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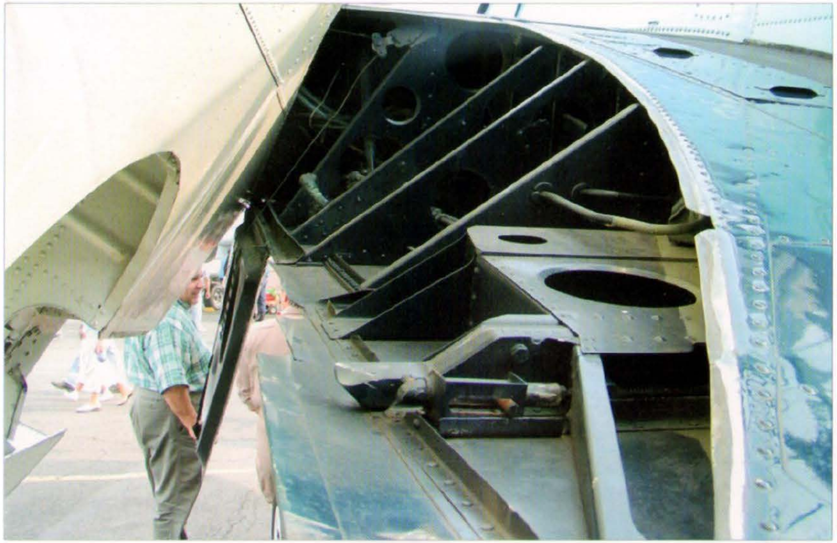
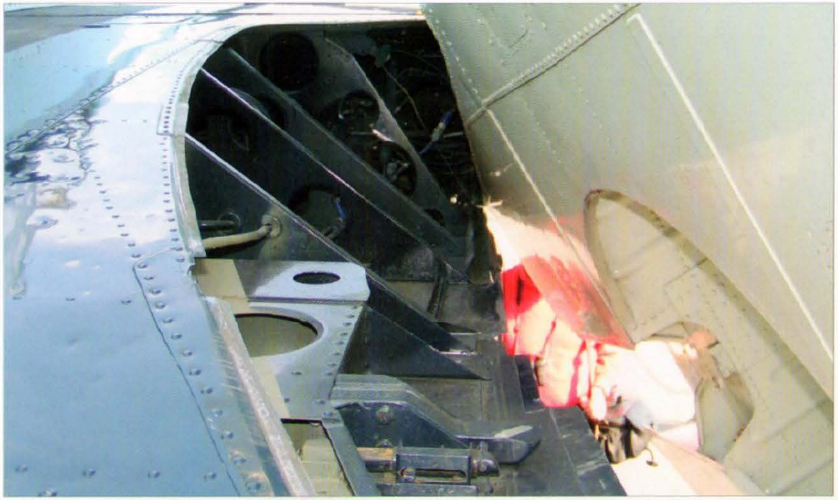
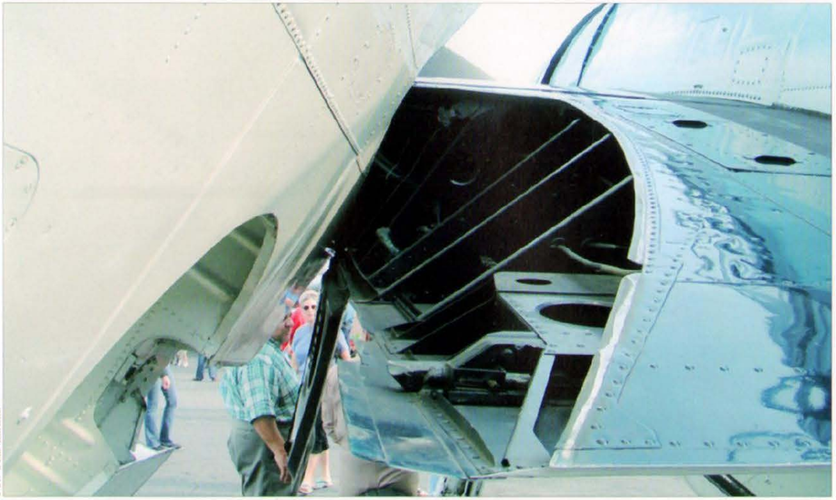


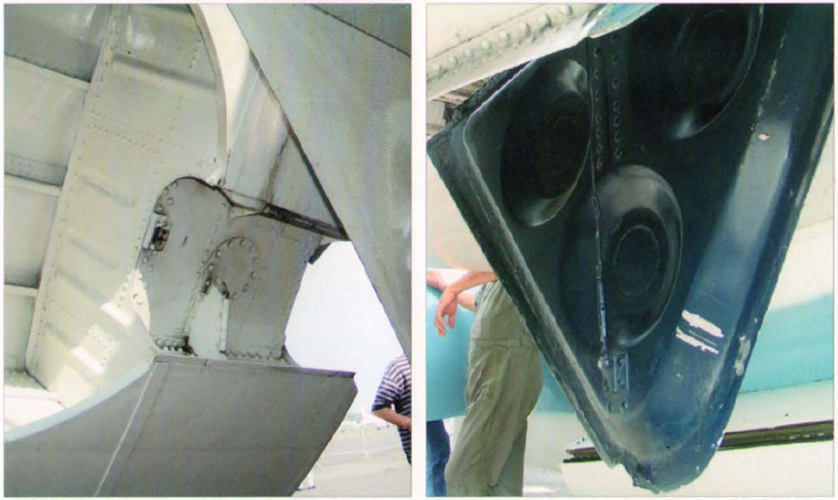


Internal construction of the starboard wing, centre section, at the fold line • Wewnętrzna konstrukcja centropłata prawego skrzydła

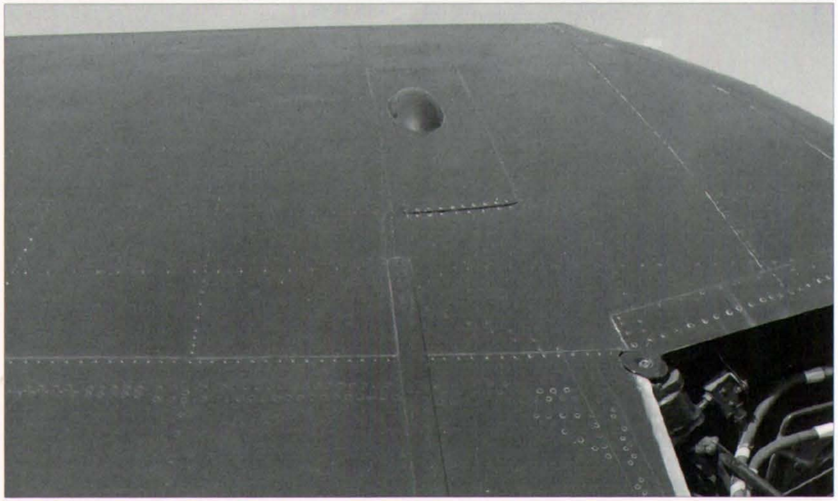


Fot. Tom Żmuda

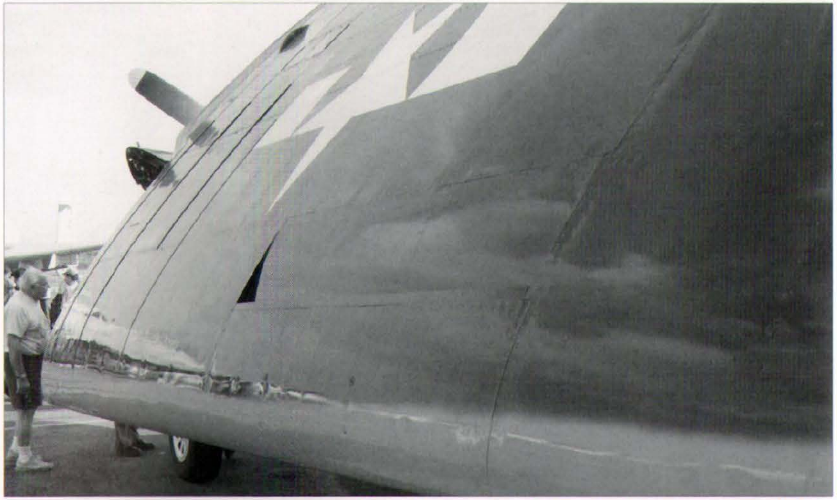
Close-up of the internal construction of the folded port wing, centre section • Wewnętrzna konstrukcja centropłata lewego skrzydła



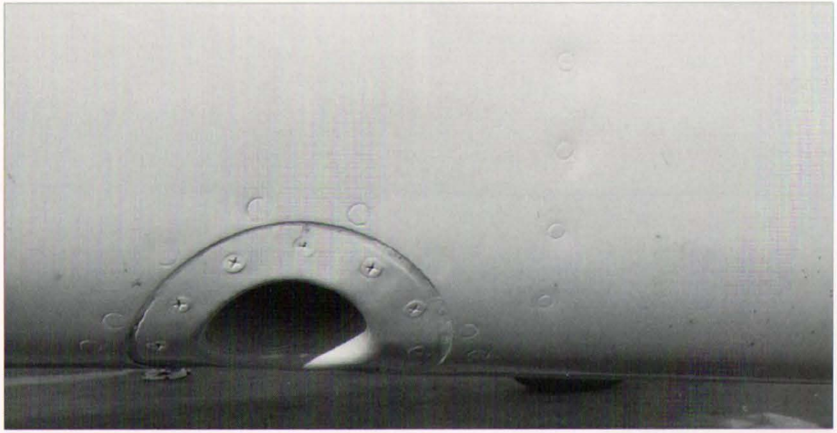
Main gear wheel well and a triangular piece of the lower wing surface, automatically lowered when folding wings • Wnęka podwozia



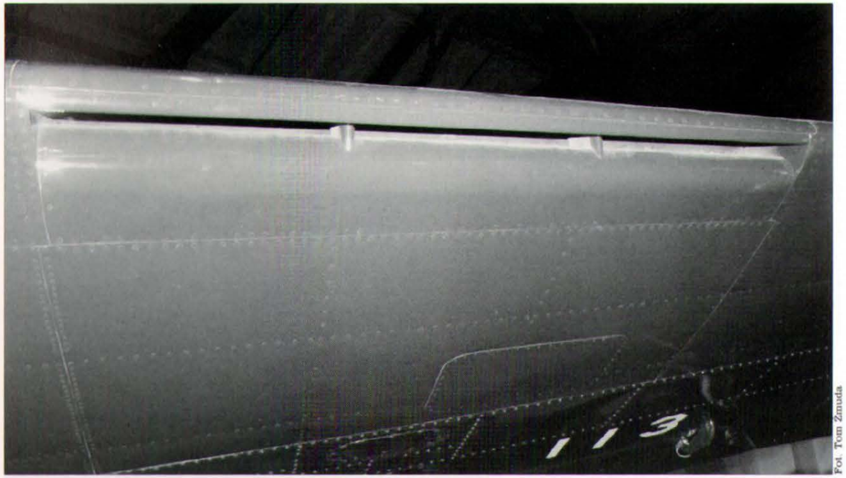
Upper surface of the starboard folded wing. Note the fairing over the breech of the wing-mounted machine gun • Górna powierzchnia prawego skrzydła w pozycji złożonej



The upper surface of the port wing. Note the intake of the solid leading edge slot • Górna powierzchnia lewego skrzydła

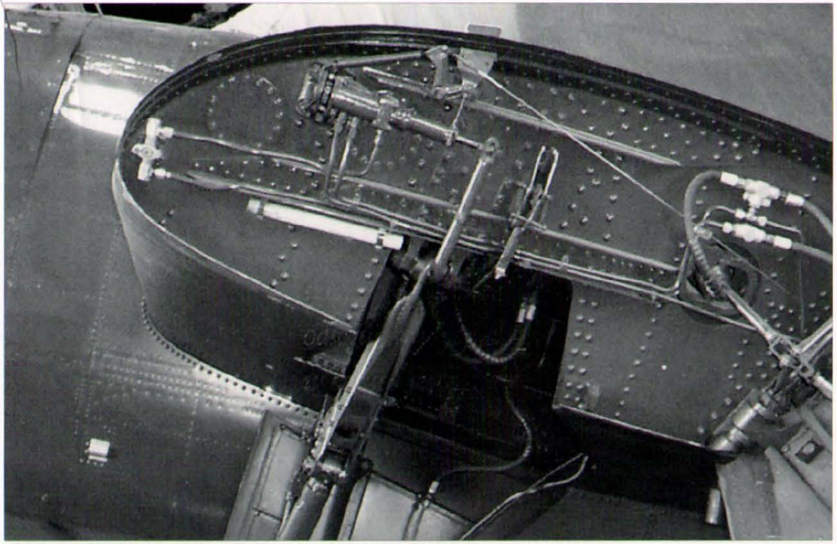


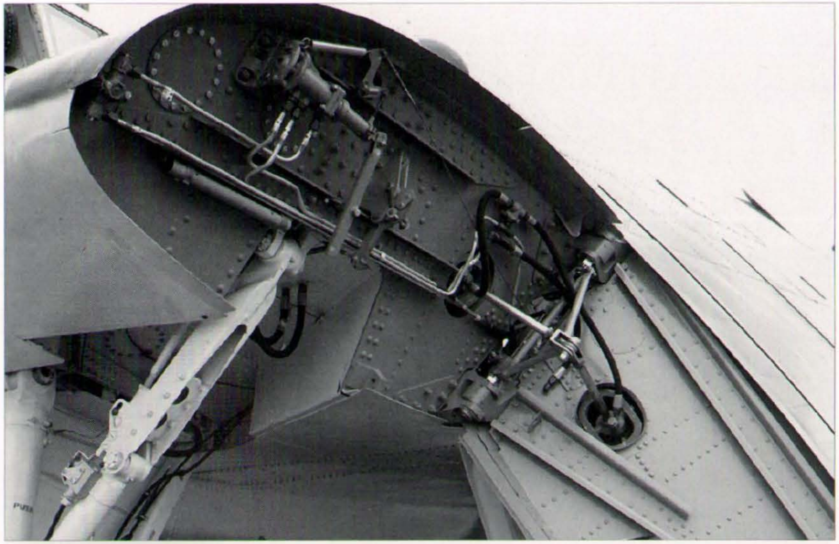
The Colt-Browning M2 12.7 mm machine gun blast tube in the leading edge of the wing. TBF/TBM-1C sub-type had a revised forward firing armament of two wing-mounted machine guns (335 rounds per gun), instead of the former 7.62 mm light machine gun mounted in the fuselage • Wylot skrzydłowego karabinu maszynowego Colt-Browning M2 12,7 mm



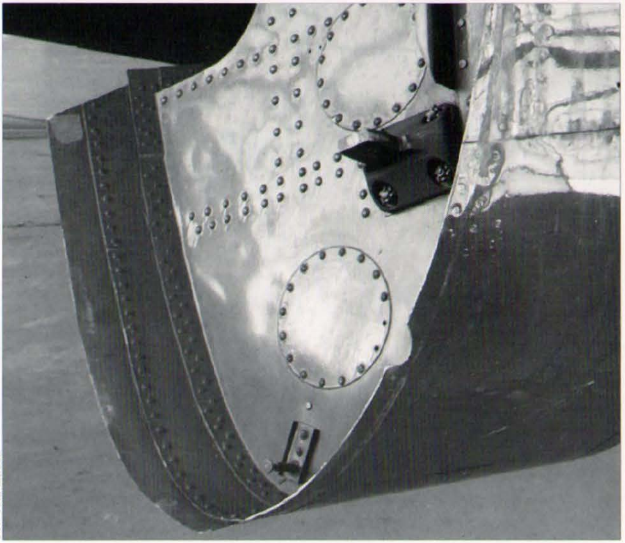
Fot. Tom Żmuda

The outlet of the leading edge slot on the lower wing surface. Due to its shape, the slot was often called a 'letter box' • Szczelina wlotowa slotu na dolnej powierzchni krawędzi natarcia lewego skrzydła



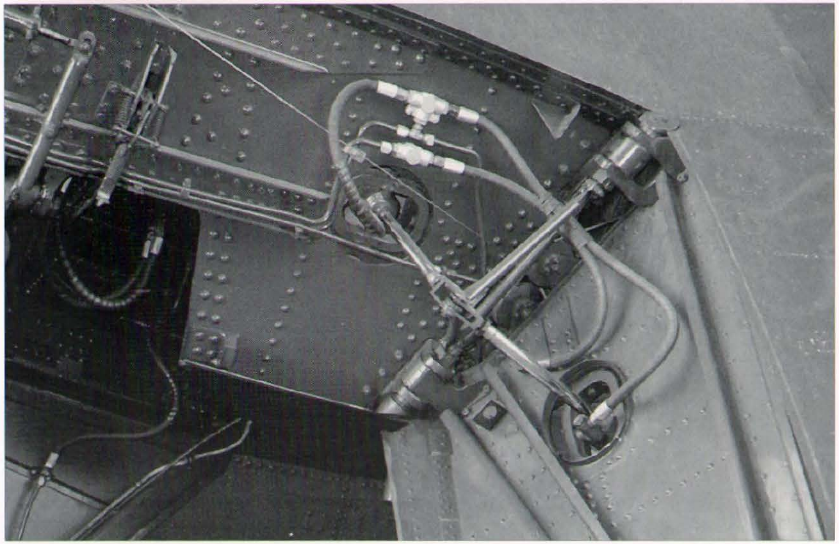


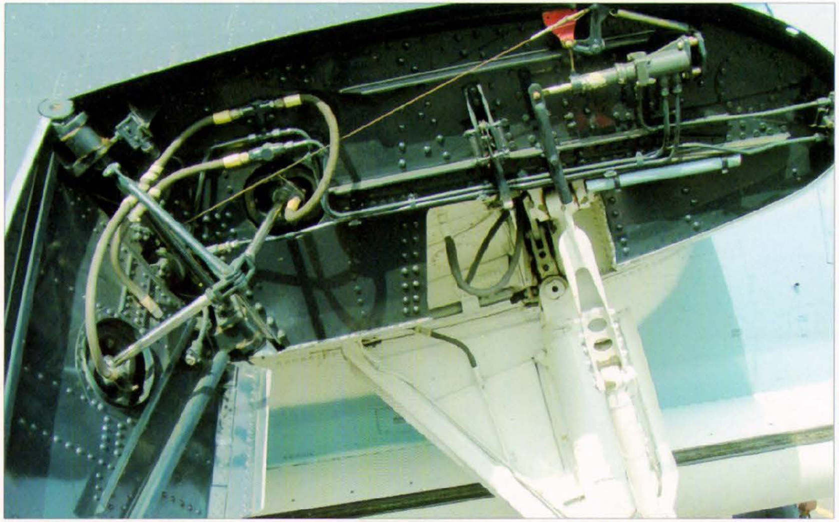
The port wing folding mechanism • Mechanizm składania lewego skrzydła



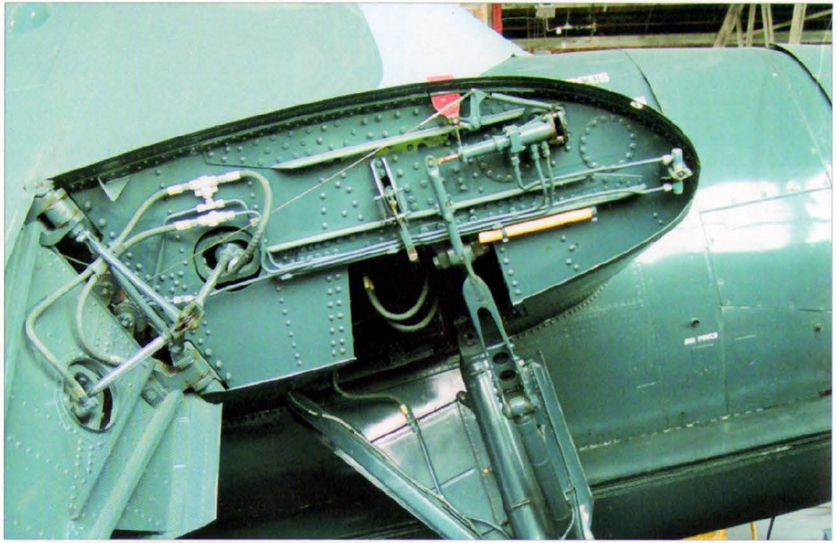
Fot. Tom Żmuda

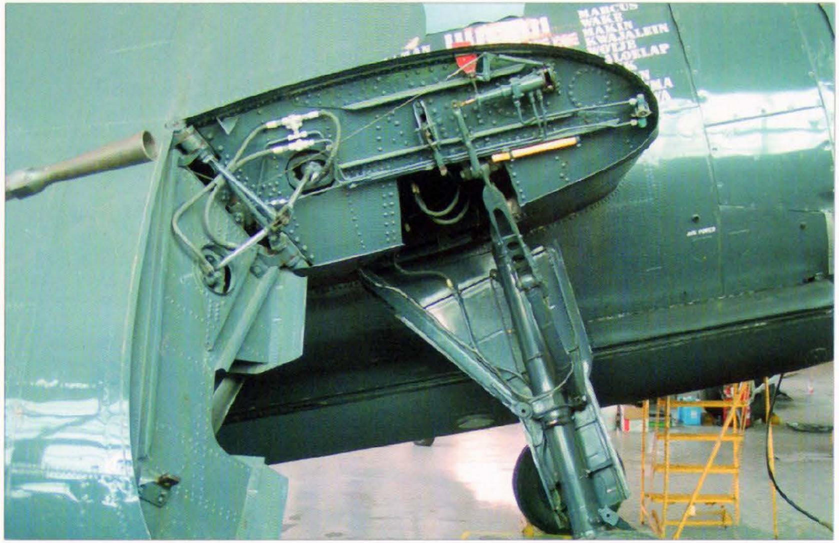
Metal fittings supporting the unfolded wing • Okucie mocujące skrzydło w pozycji rozłożonej

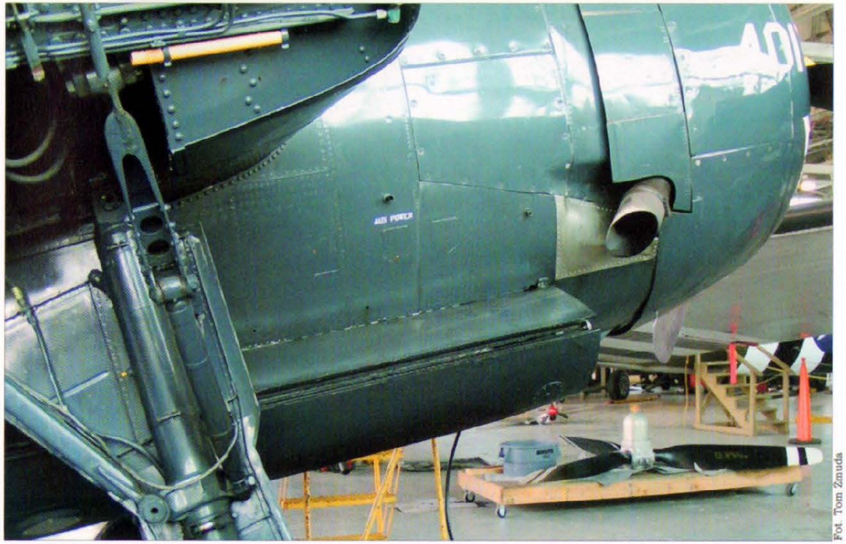




The starboard wing folding mechanism • Mechanizm składania prawego skrzydła







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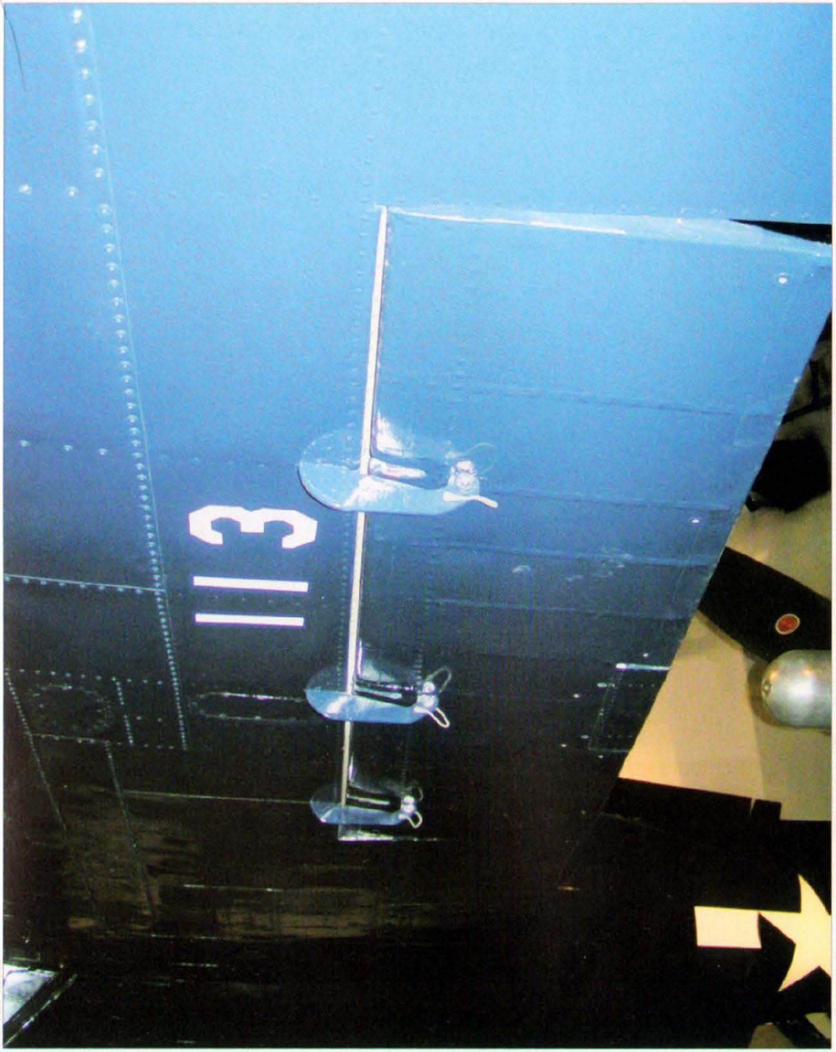
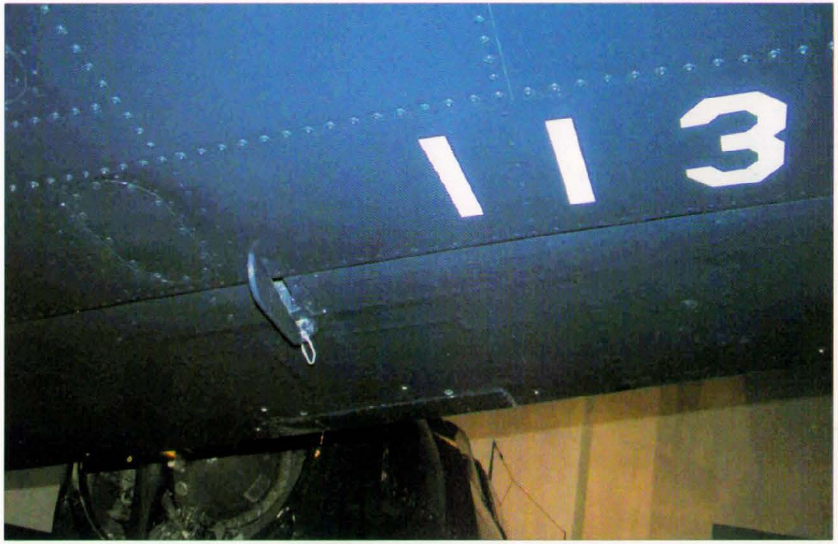
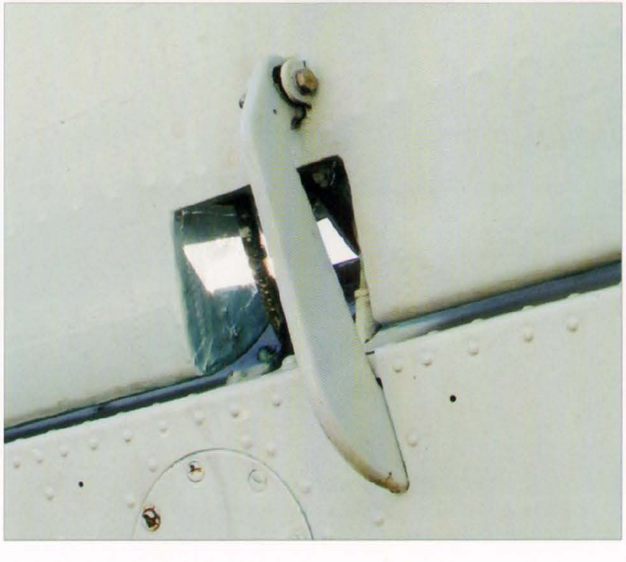


Fot. Tom Żmuda

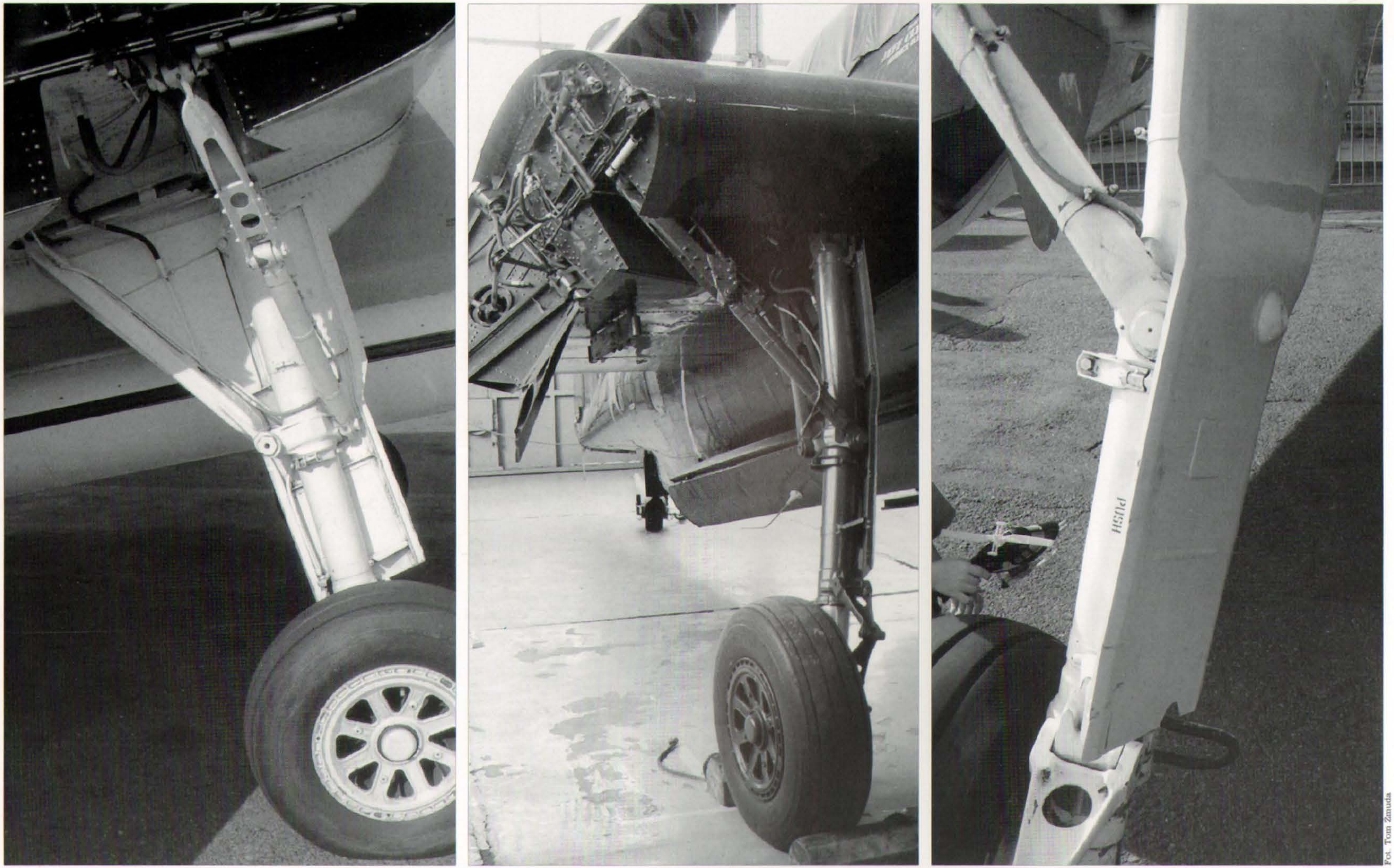
Dolna powierzchnia lewego skrzydła. Widoczna lotka z trzema zawiasami • Dolna powierzchnia lewego skrzydła. Widoczna lotka z trzema zawiasami





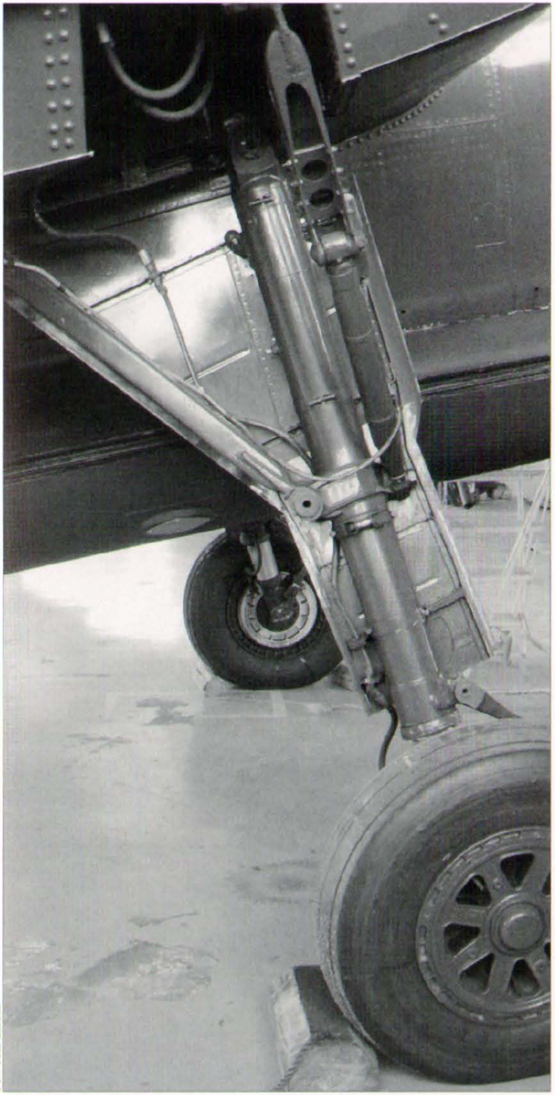
The lower surface of the port wing. Seen here is the port aileron with its three hinges.

Each aileron was mounted by three external hinges. The ailerons were of metal and covered with fabric. The could move up and down by −9.5/+20.5 degrees • Lotki i ich zawiasy

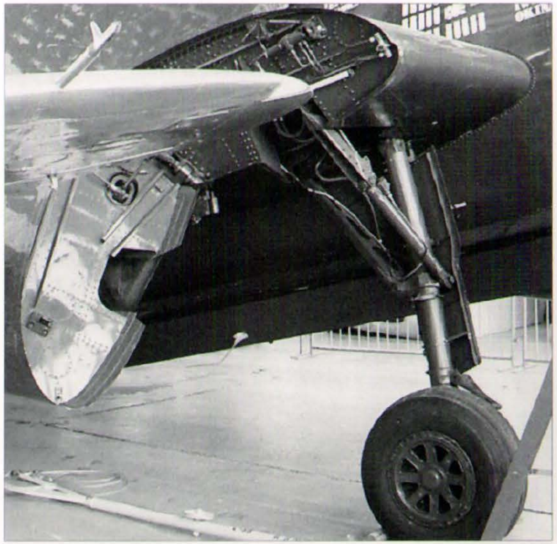


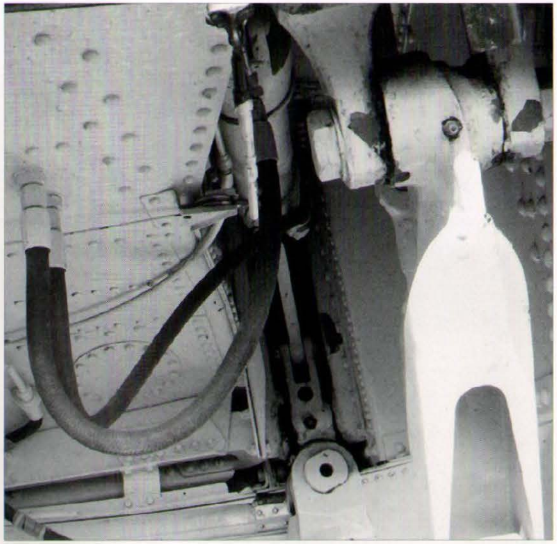
The starboard main gear set. The hydraulically-driven undercarriage was retracted outward of the fuselage. The gear covers extended only over the wheel struts • Prawy zespół podwozia głównego

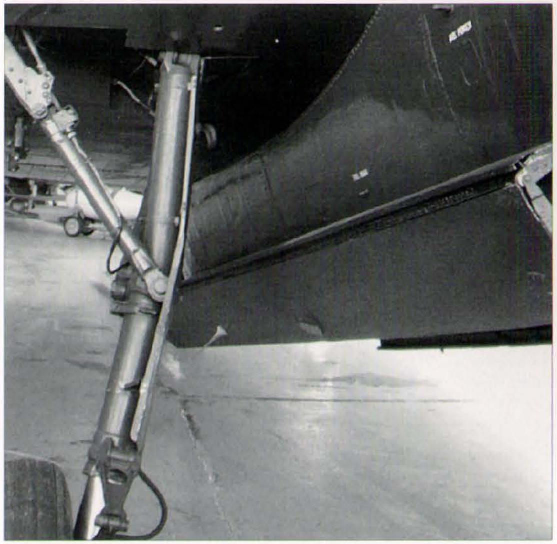
Fot. Tom Żmuda

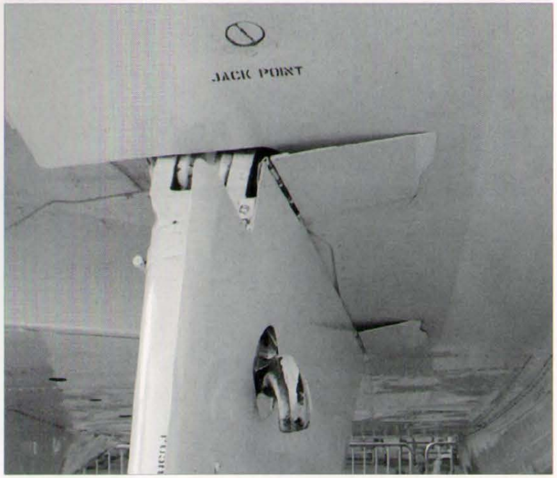


Fot. Tom Zmuda

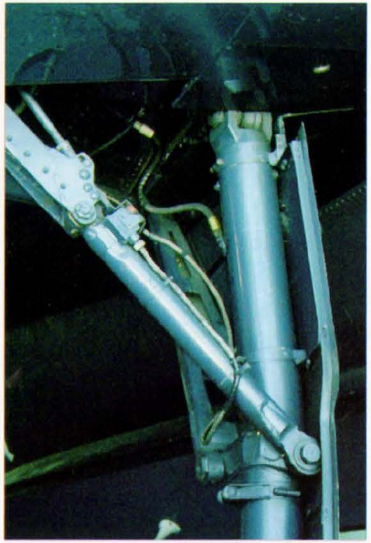


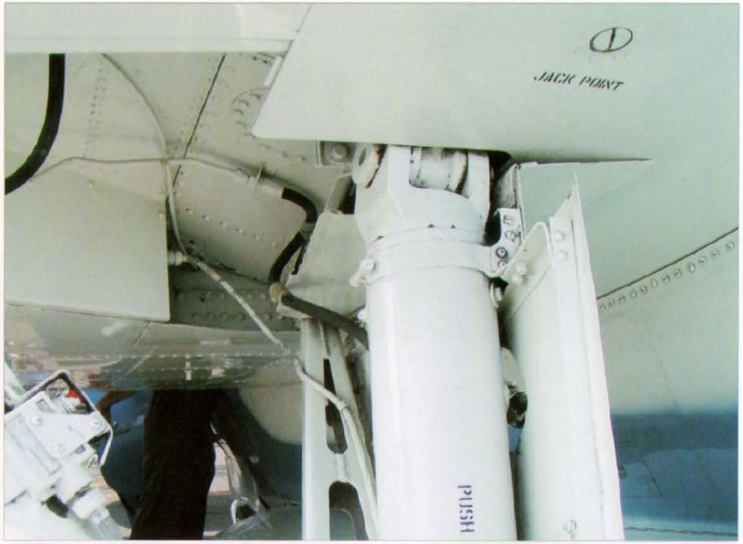


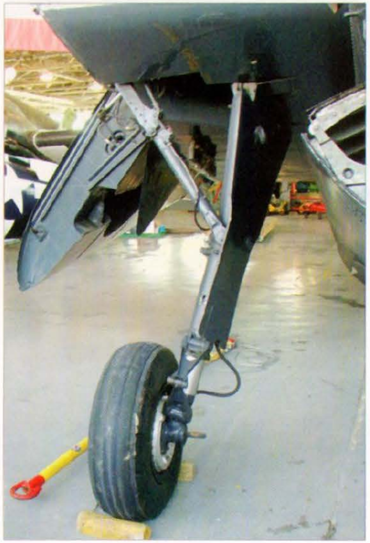


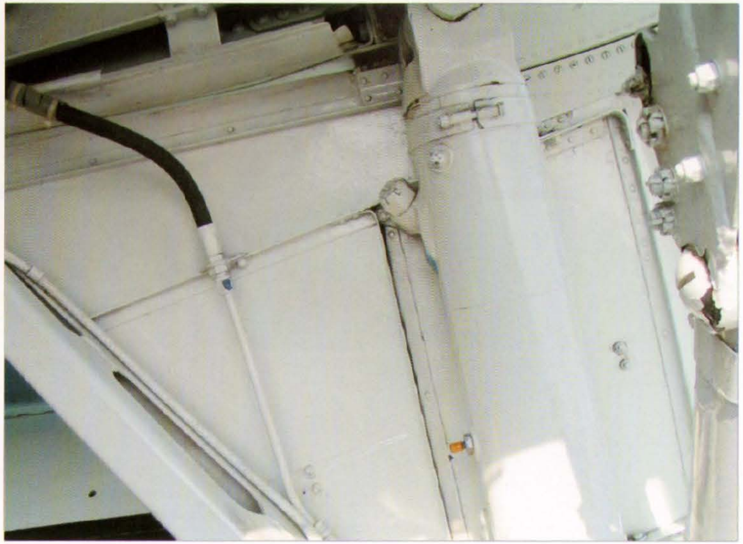


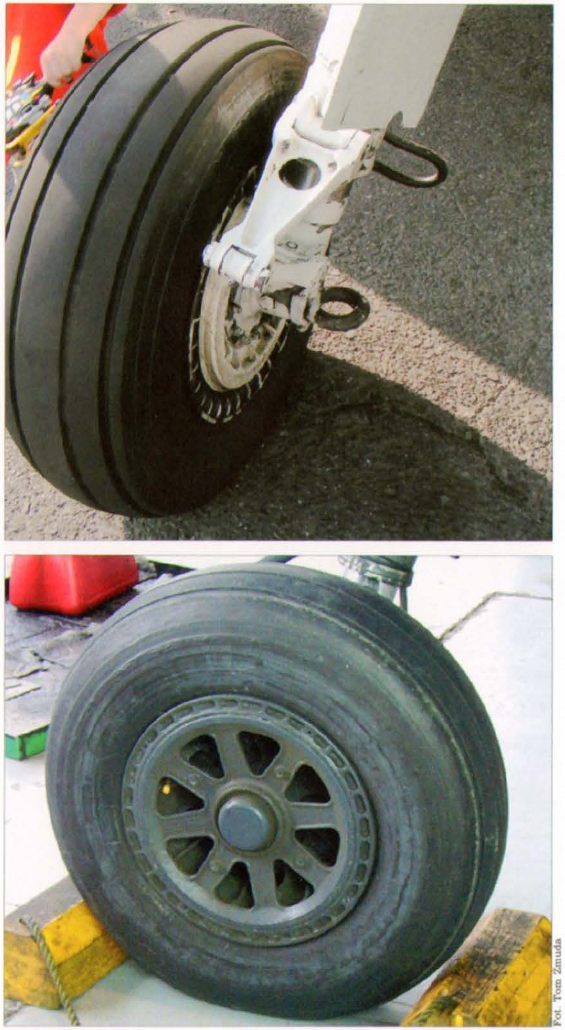
The hook on the upper part of the starboard wheel strut served as an attachment point for the catapult rope • Hak w górnej części osłony prawej goleni



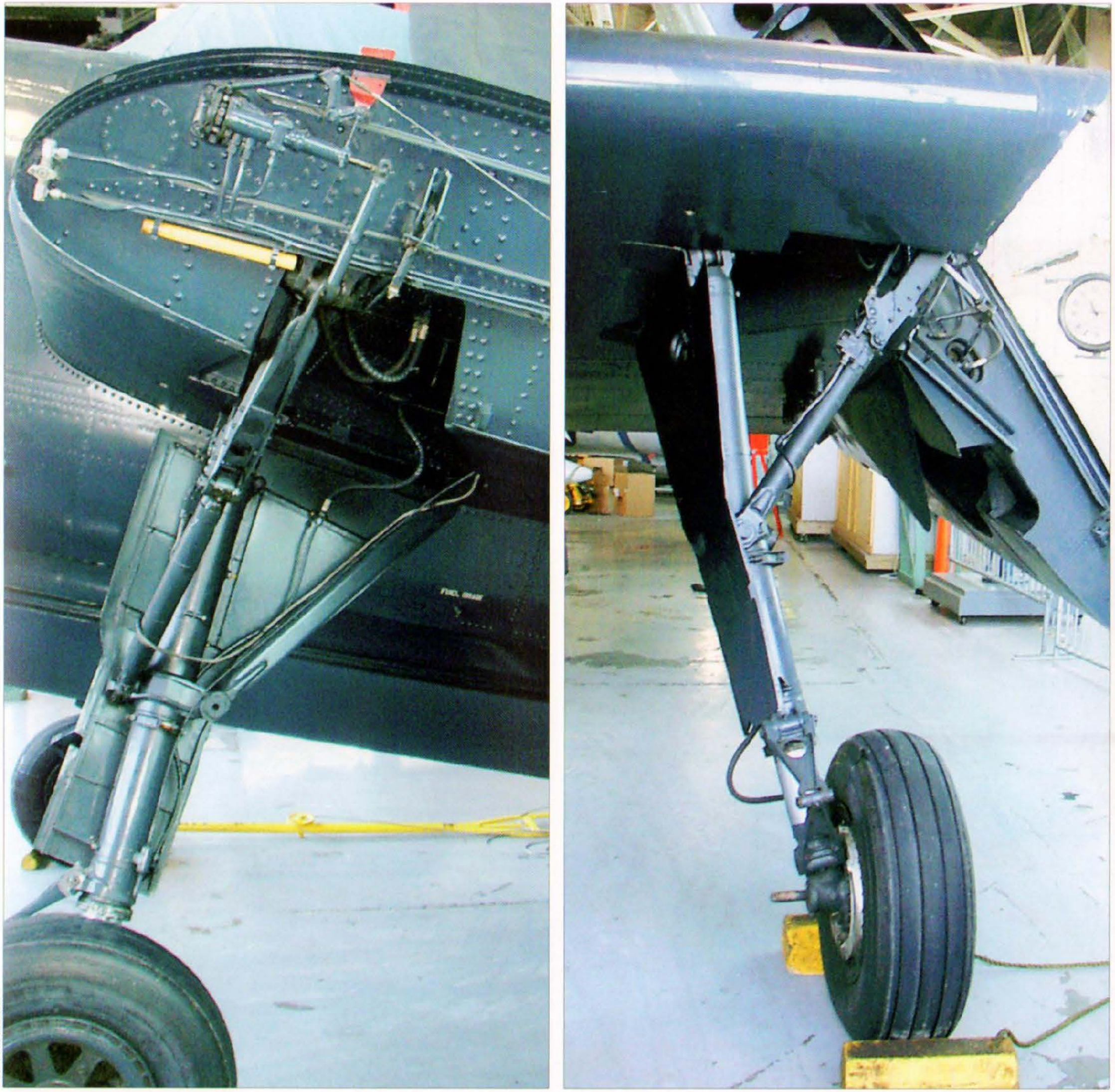








Left and right main gear wheels. Visible are the wheel nave and the tugging attachment point. Note the 34 x 9 inch (864 x 229 mm) Goodyear tyres • Prawe i lewe koło podwozia

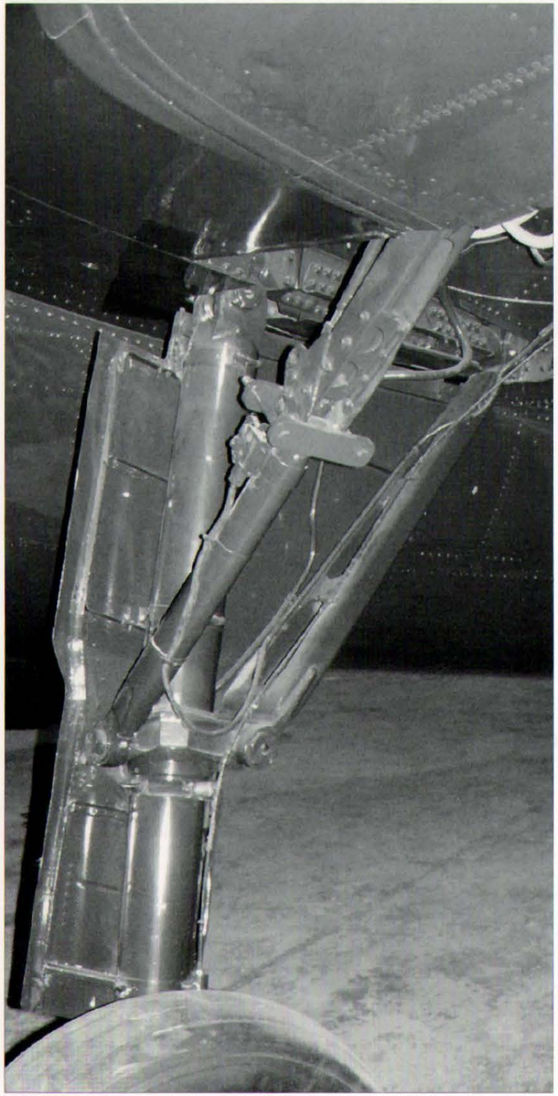


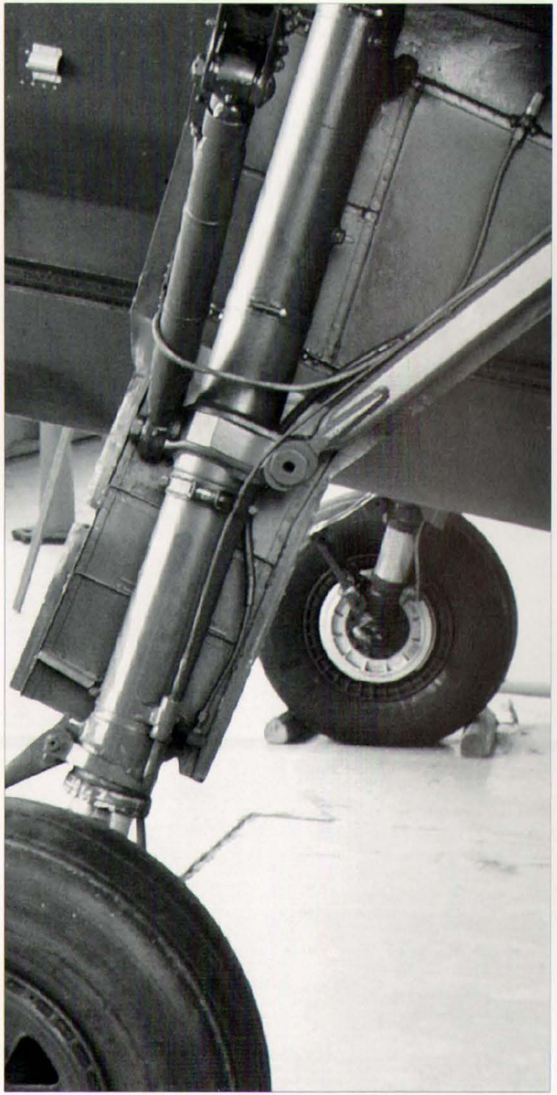
Fot. Tom Zmuda

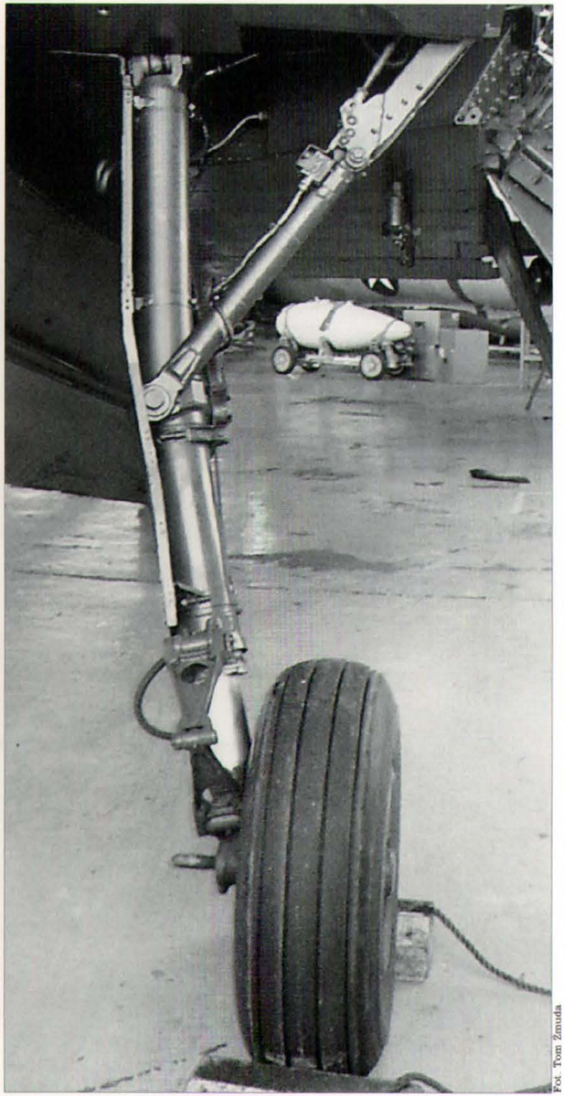
Technical data on the TBF/TBM-3 "Avenger"

Dimensions	
Span [m]	16,51
Length [m]	12,16
Hight [m]	5,02
Liftint surface [m^2]	45,52
Weights	
Empty [kg]	4913
Loaded [kg]	7609
Max. loaded [kg]	8286
Performance	
Max. speed [km/h]	430
at an altitude of [m]	4545
Max. speed at 0 m altitude [km/h]	404
Cruising speed [km/h]	243
Climb rate [m/s]	5,92
Ceiling [m]	7090
Range with full weapon load [km]	1819
Range on reconnaissance missions [km]	3091
Engine	
Type of engine	Wright R-2600-20
Power [kW/hp]	1417/1900
Armament	
Machine guns	2 x 12,7 mm wing-mounted 1 x 12,7 in the dorsal turret 1 x 7,62 mm in the ventral position
Bombs [kg]	907 (max. 1005)
Rockets	8 x 127 mm

Port main gear set. The shock-absorbers enabled touch-downs with a vertical speed up to 4.9 m/s • Lewy zespół podwozia głównego







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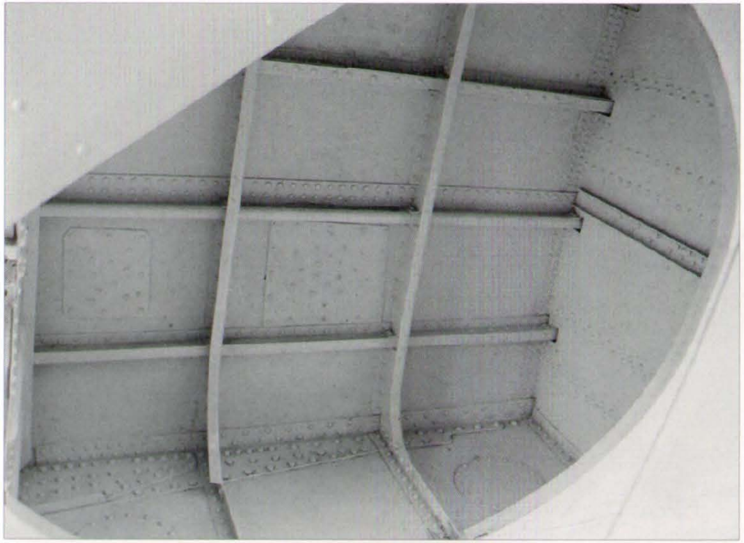
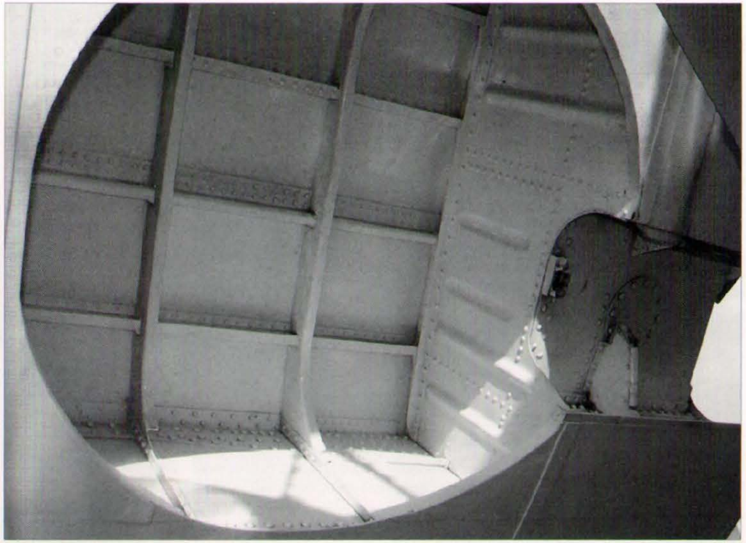
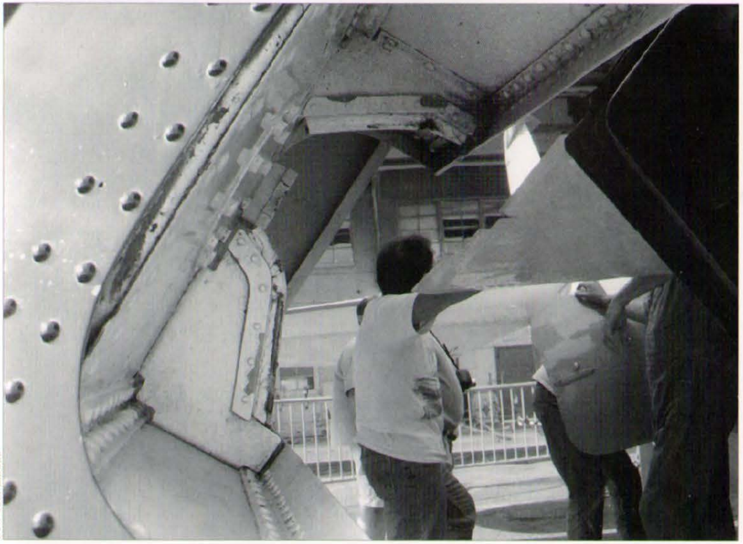
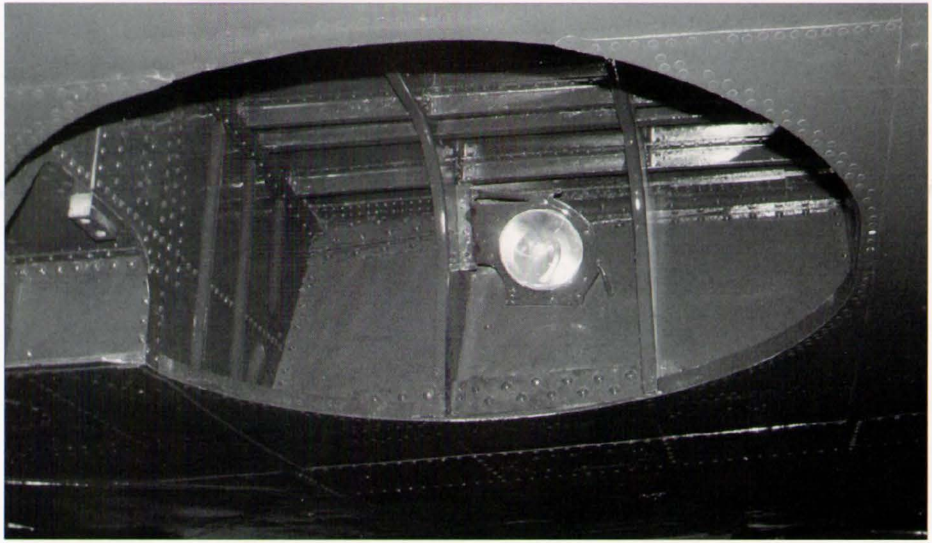


Starboard main undercarriage wheel well • Prawa wnęka podwozia głównego

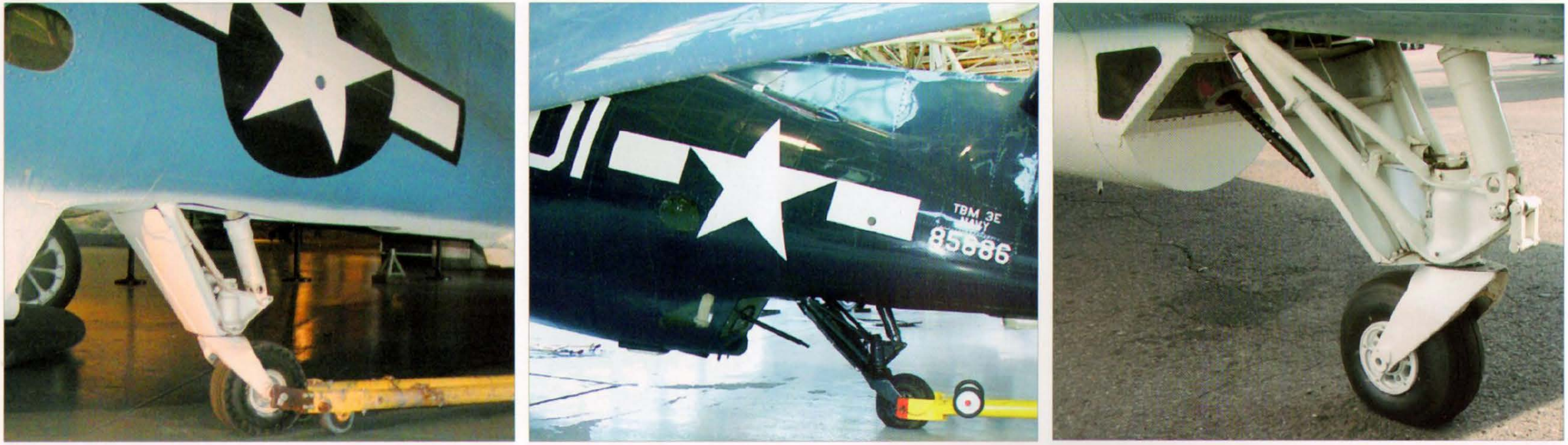
Port main undercarriage wheel well • Lewa wnęka podwozia głównego



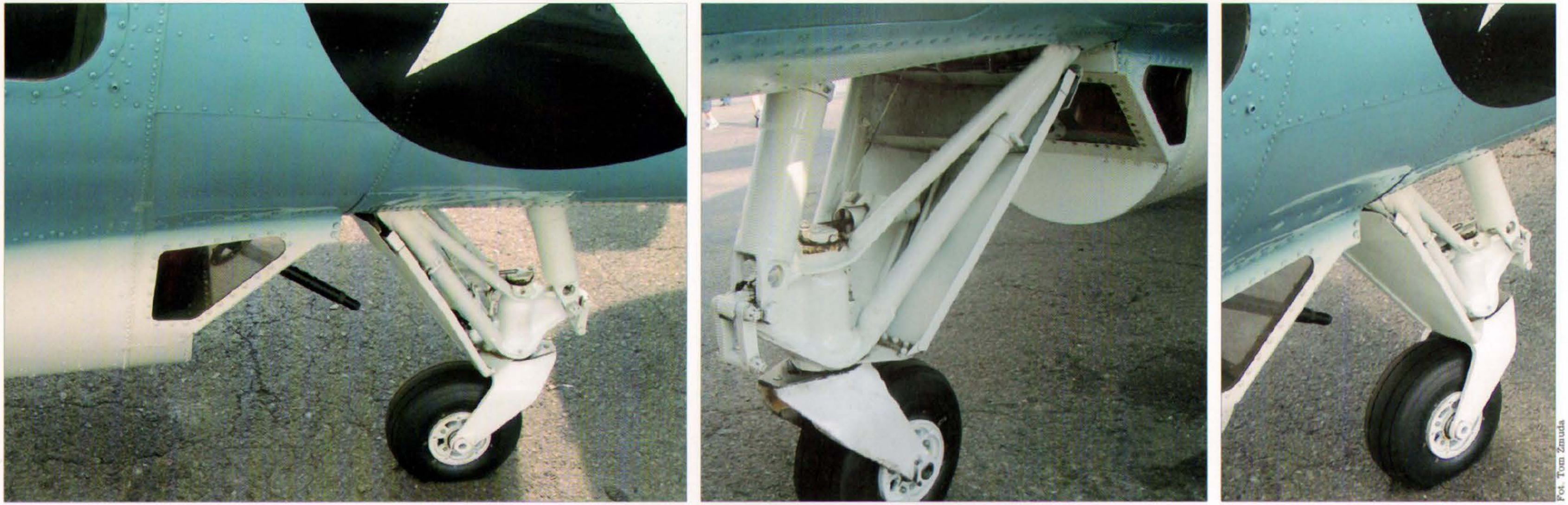




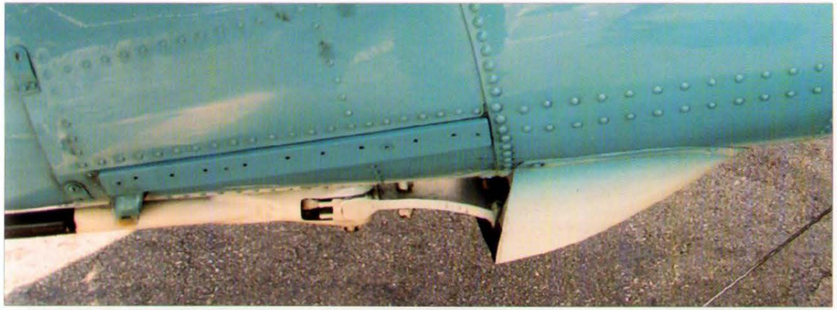
Fot. Tom Żmuda

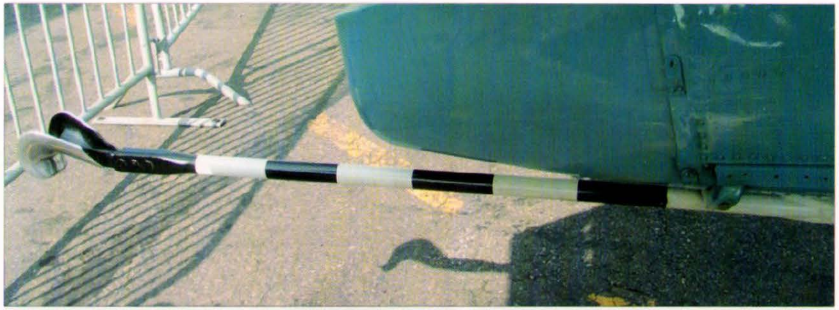


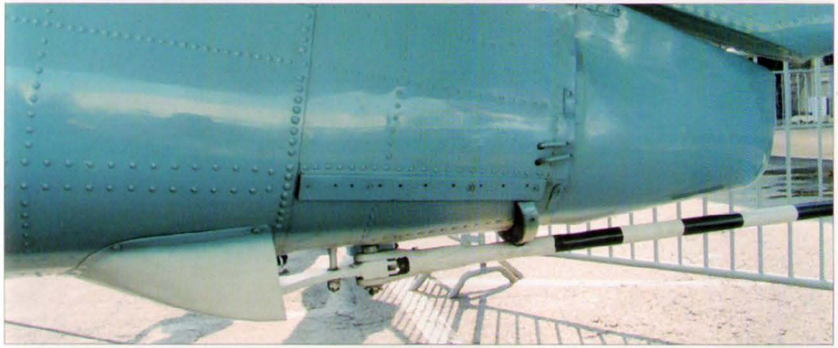
The tail wheel set. Carrier-borne aircraft were fitted with 14.5 x 5 inch (368 x 127 mm) tyres of solid rubber, manufactured by the Grizzly company. Land-based aircraft operating were equipped with standard Firestone tyres of the same dimensions. The tail wheel was self-aligning but could as well be locked. As in the case of the main gear wheels, the cover extended only over the wheel strut • Zespół podwozia tylnego

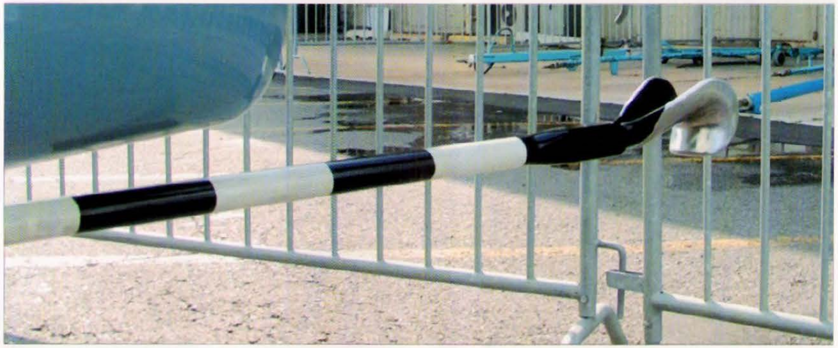


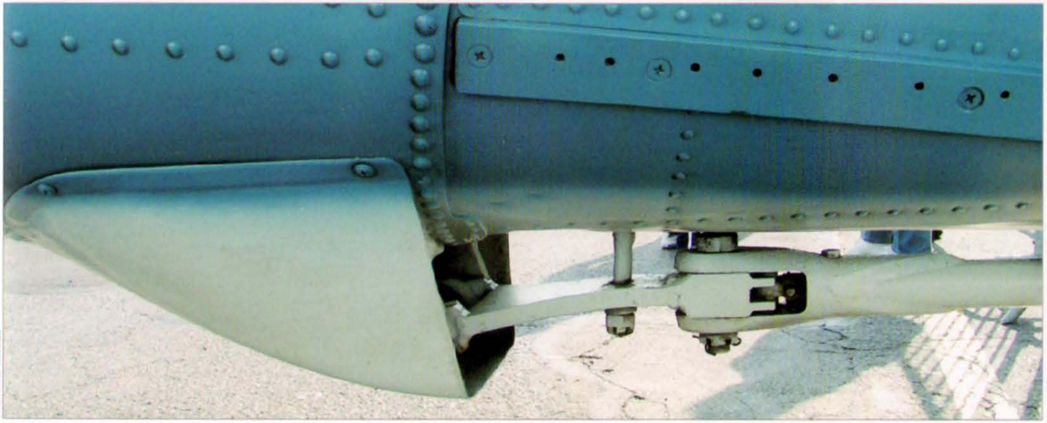
Fot. Tom Zmuda











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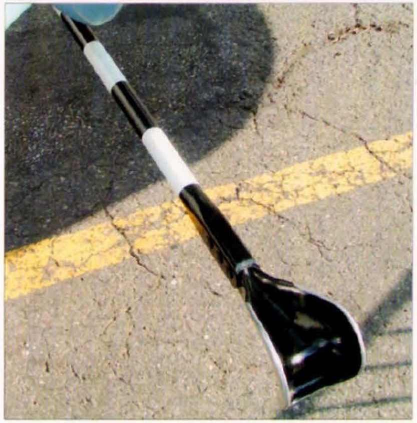
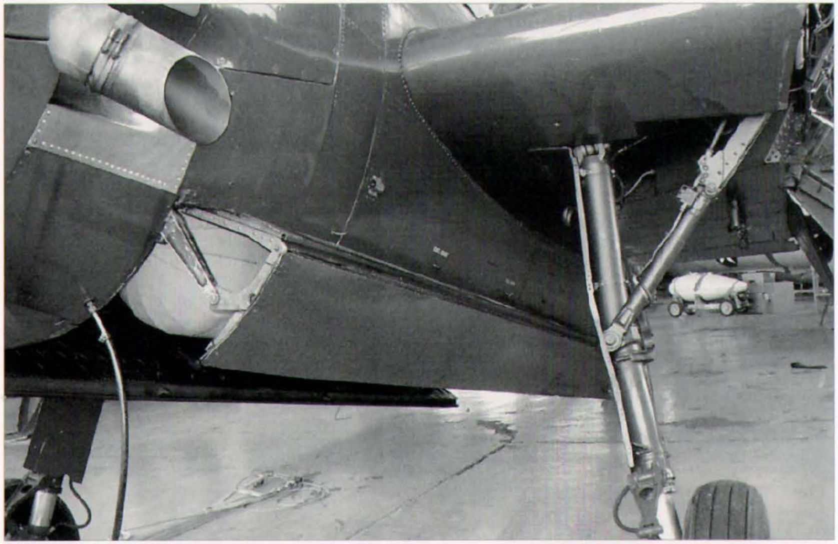
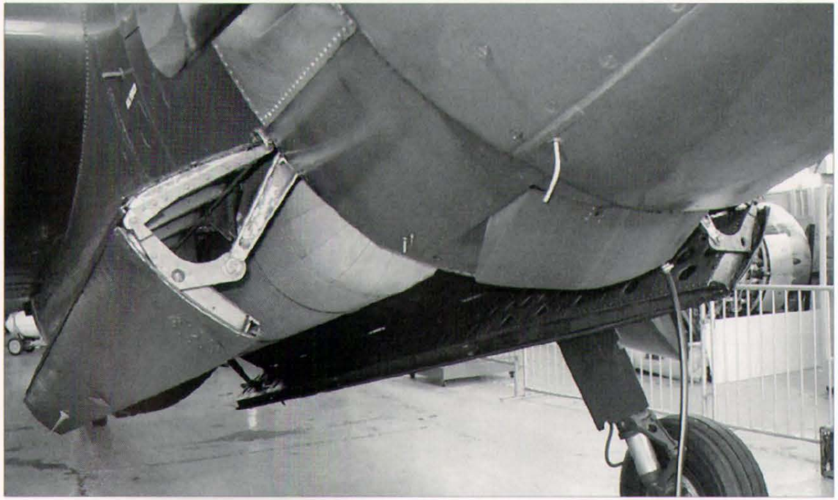
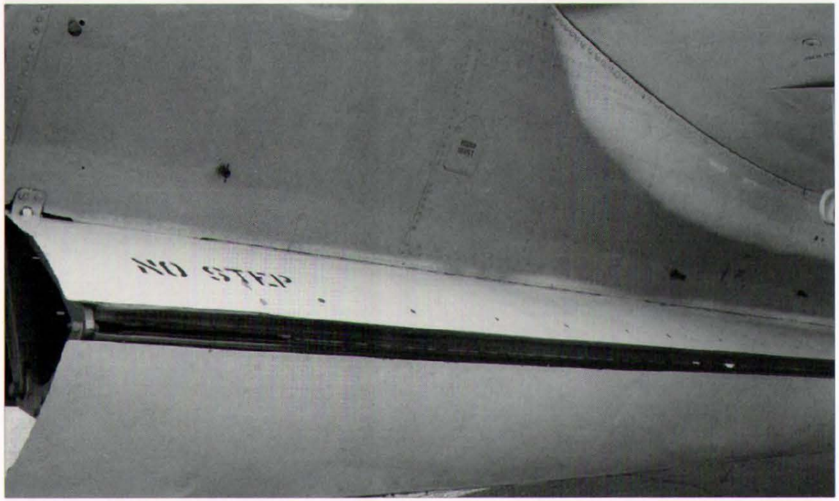
The external arrestor hook as used from TBM-3E subtype onward (starting from BuNo 86175). Hitherto used was a hook sliding out of the interior of the aircraft. The hook bore the usual black and white stripes for improved visibility from the deck of the carrier • Zewnętrzny hak do lądowania



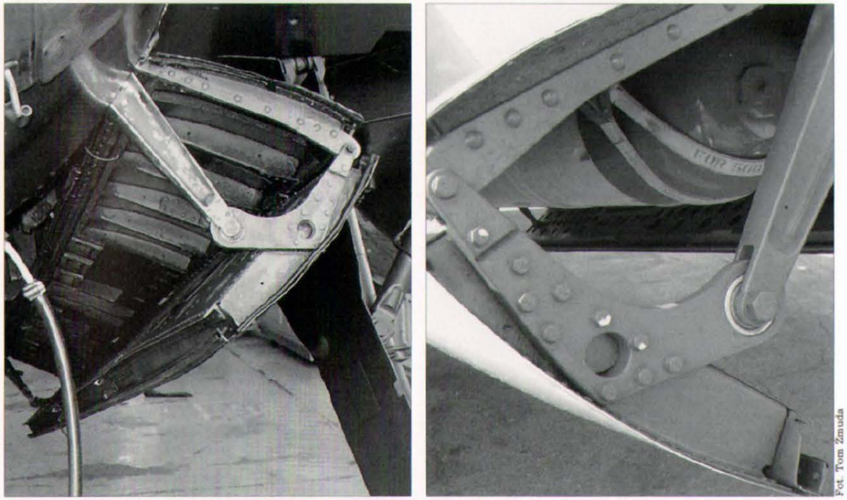




Two-piece folding starboard door of the open bomb bay • Prawe drzwi komory bombowej w pozycji otwartej

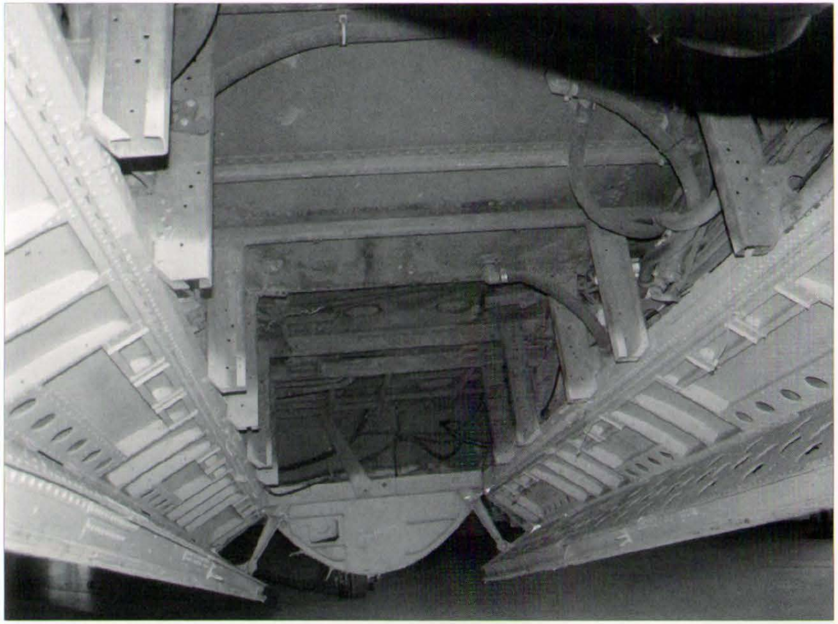


Two-piece folding port door of the bomb bay in the 'open' position • Lewe drzwi komory bombowej w pozycji otwartej

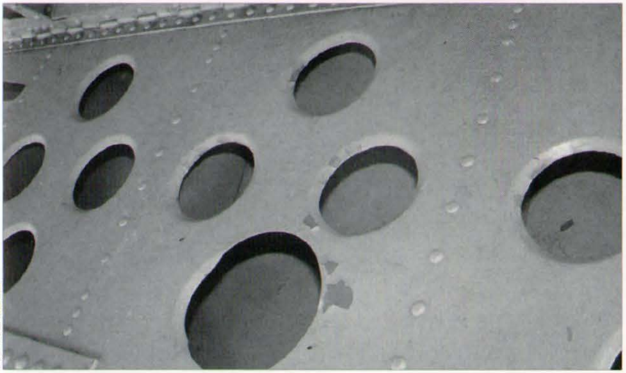


Levers of the mechanism opening the bomb bay doors • Dźwignie mechanizmu otwierania drzwi komory bombowej

Fot. Tom Żmuda

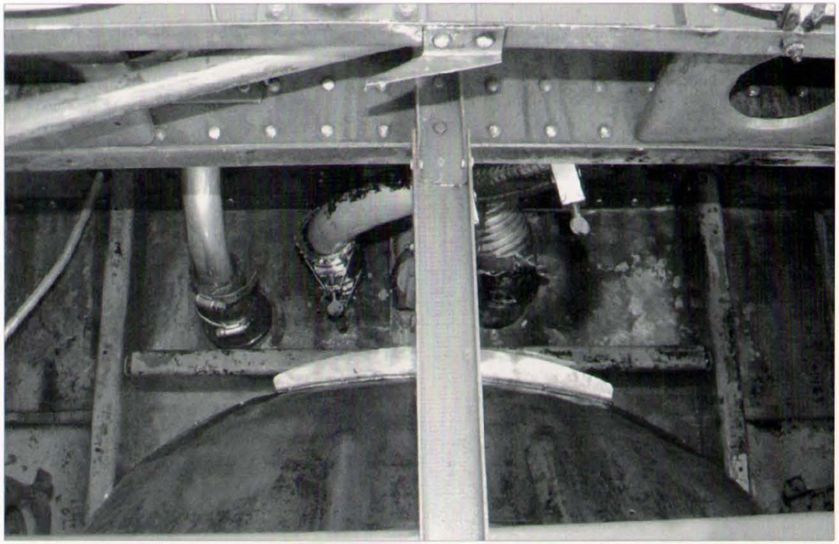


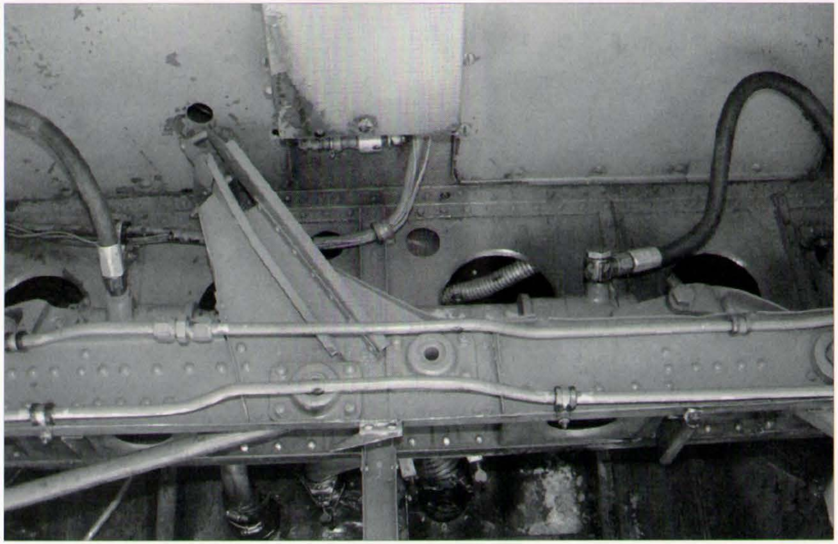
The interior of the bomb bay. "Avenger" was the first US Navy carrier bomber equipped with an internal bomb bay. It could (alternatively) hold twelve bombs of 45.4 kg each, four 227 kg bombs, a single bomb of 454, 726, or 907 kg, two armour-piercing bombs of 454 kg each, or one MK 13 type torpedo • Wnętrze komory bombowej

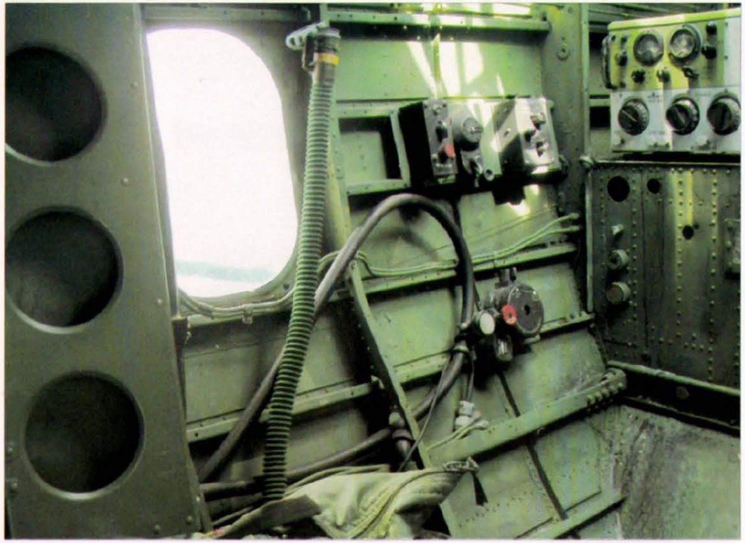


The inner side of the lower part of the bomb bay door. The perforation served to save weight • Wewnętrzna strona dolnej części drzwi

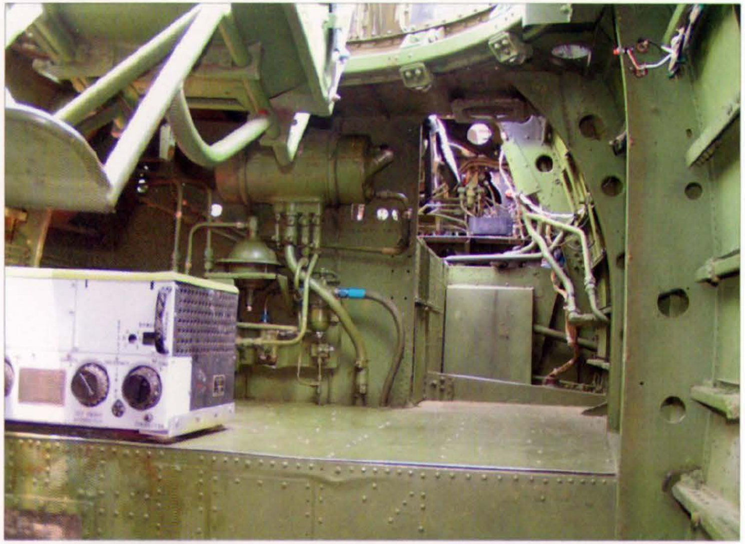
Fot. Tom Żmuda

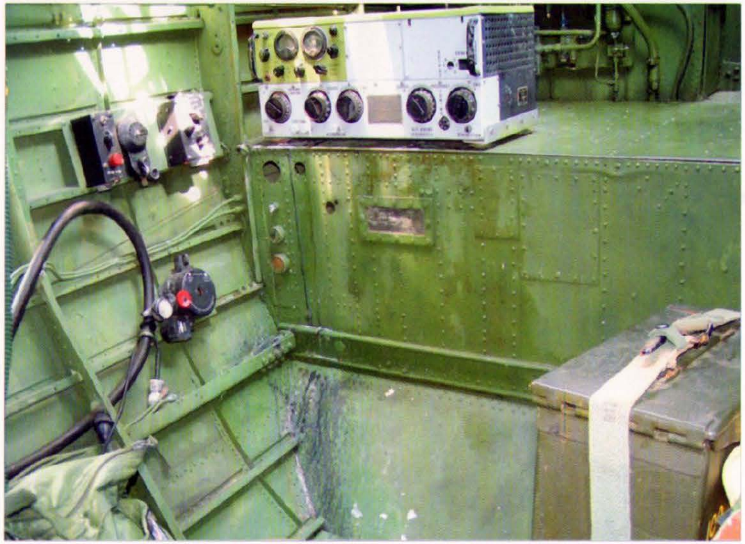




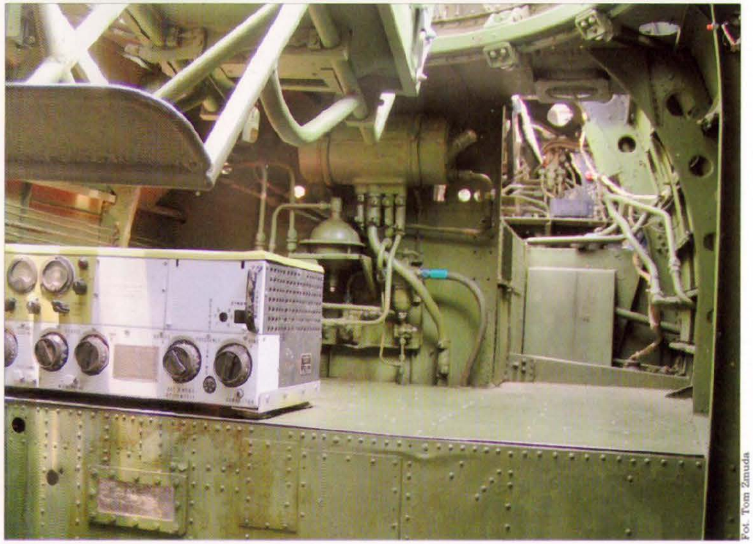


View inside the aft port fuselage, the bomb aimer's compartment. The vertical piece with three holes in it to the far left of the picture is the folded-up bomb aimer's seat. The bomb aimer's function was carried out by the radio operator, who for this purpose had to squeeze himself down here from his cockpit behind the pilot • Lewa burta tylnej części kadłuba w rejonie stanowiska bombardiera





The bomb aimer's position as seen in this museum TBM-3, viewed from the rear towards the front part of the fuselage. In comparison to a wartime aircraft, several elements are missing (the electrical device for bombs' release, among others). In the upper part of the picture, elements of the dorsal gunner's seat are visible. To the right, a narrow passage to the radio operator's compartment • Stanowisko bombardiera – widok do przodu kadłuba



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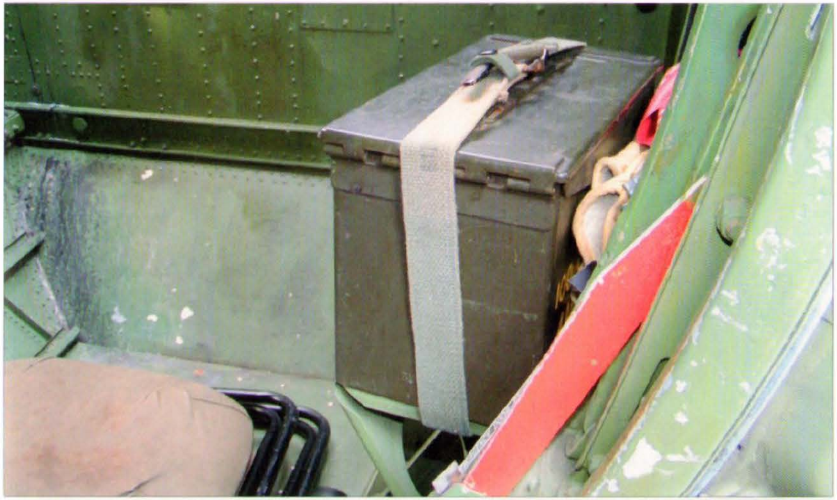
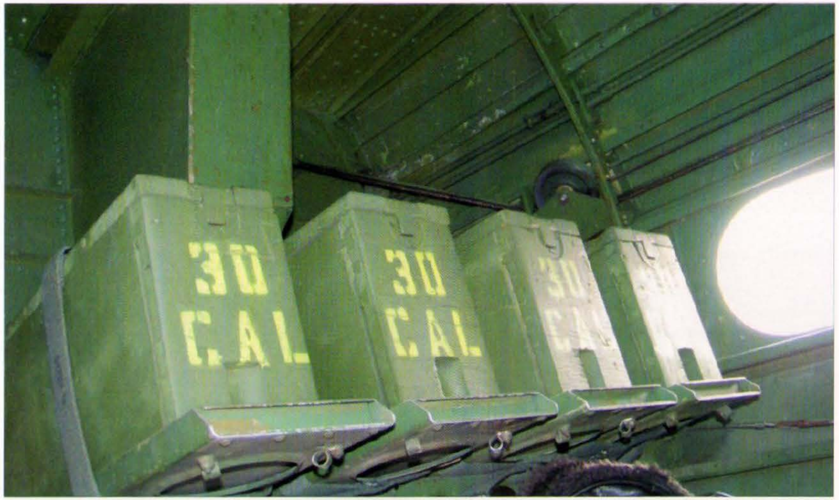
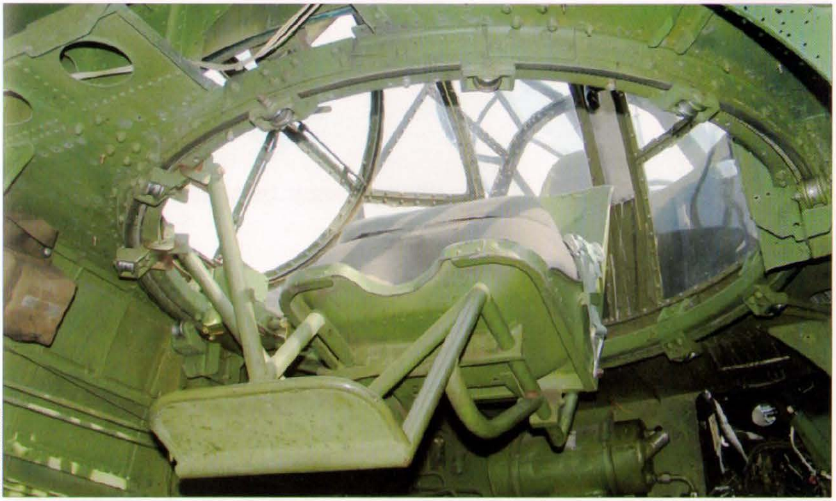


A container fastened to right side of the bomb aimer's position • Skrzynka na prawej burcie stanowiska bombardiera



Ammunition boxes with 0.3 cal. (7.62 mm) rounds, stored above ventral gunner's position • Skrzynki z amunicją 0.3 cala (7,62 mm)



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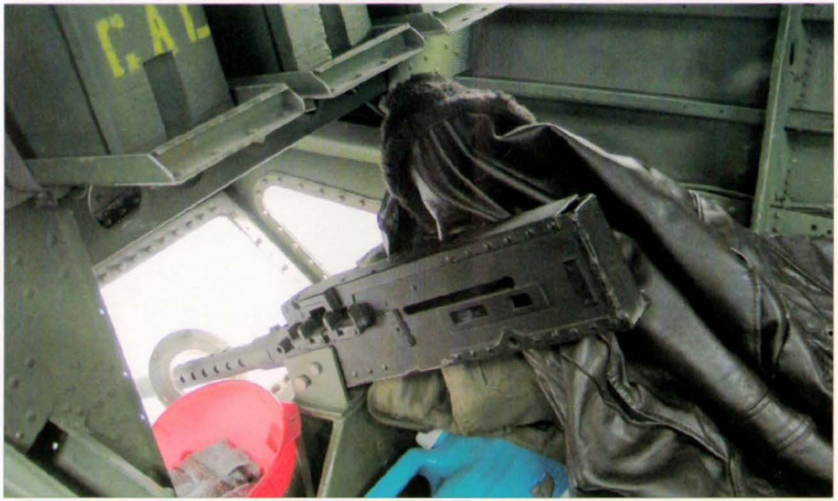
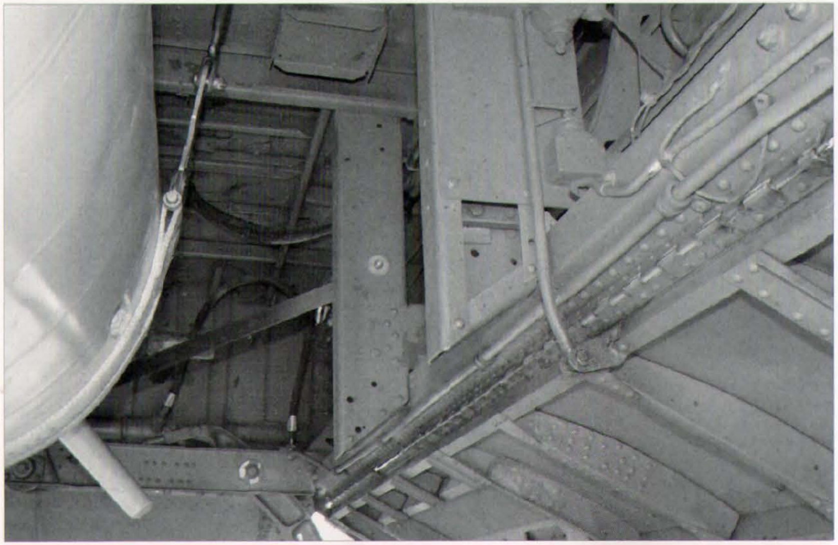
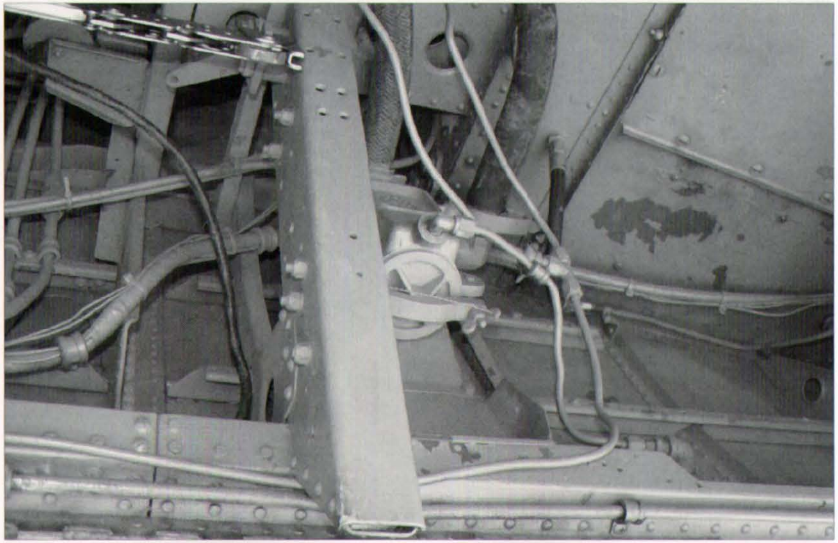
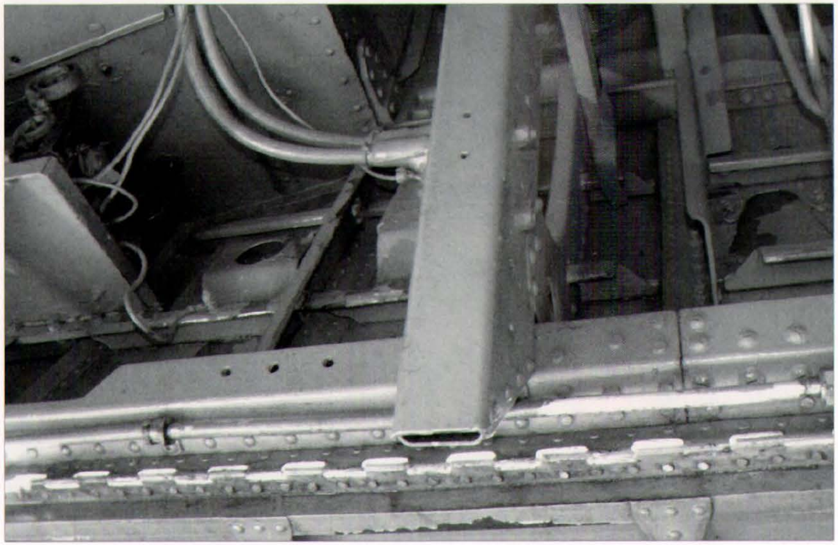
The dorsal gunner's turret as viewed from underneath, from the interior of the aft part of the fuselage • Wieżyczka strzelecka od dołu, z wnętrza tylnej części kadłuba

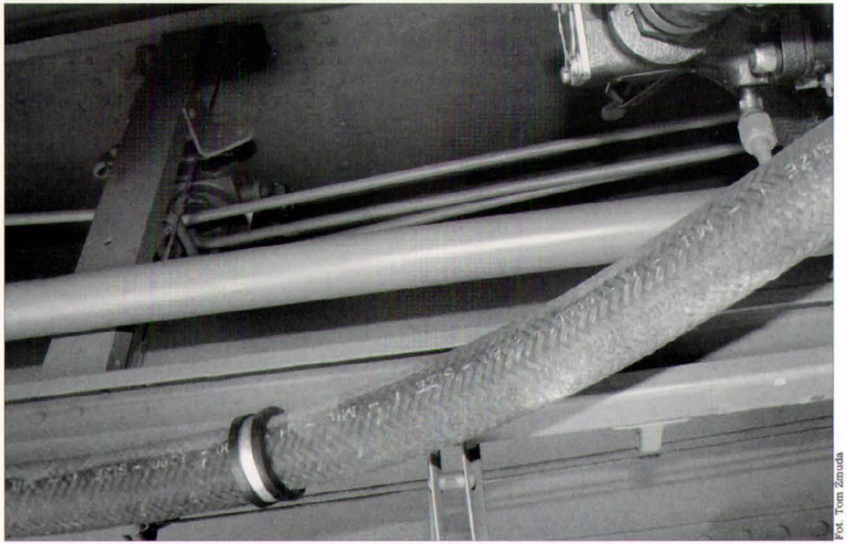


Ventral gunner's position with the rearward firing Colt-Browning 7.62 mm machine gun • Tylne dolne stanowisko strzeleckie z karabinem Colt-Browning 7,62 mm









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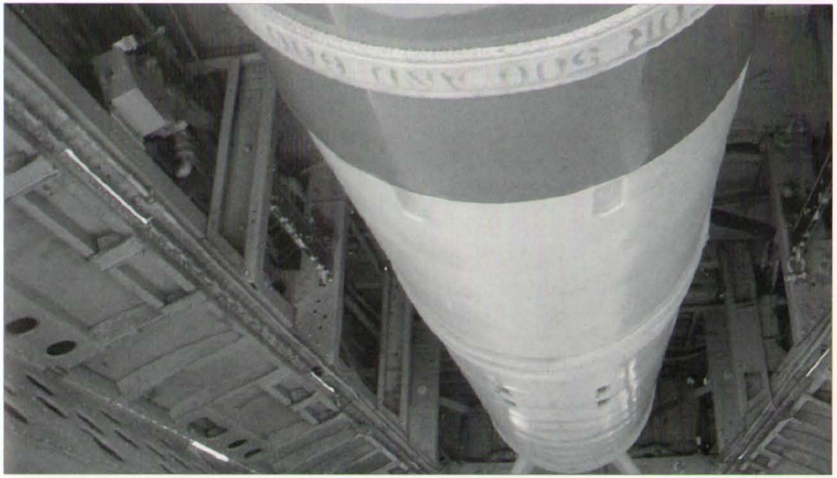
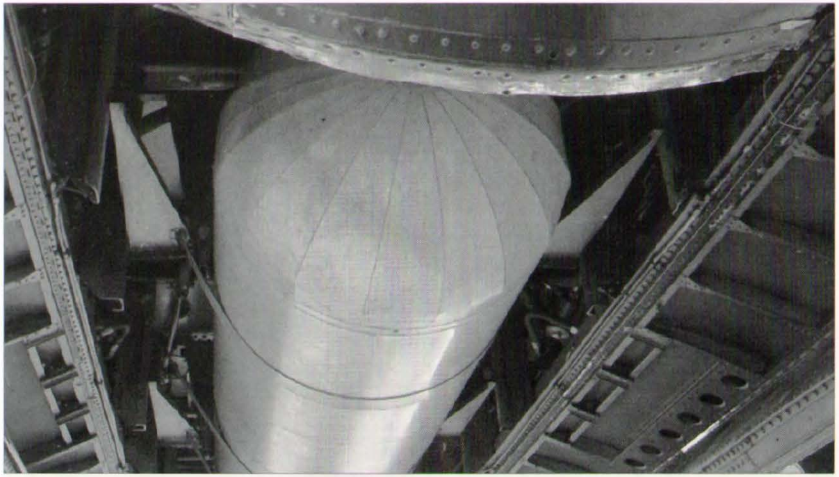
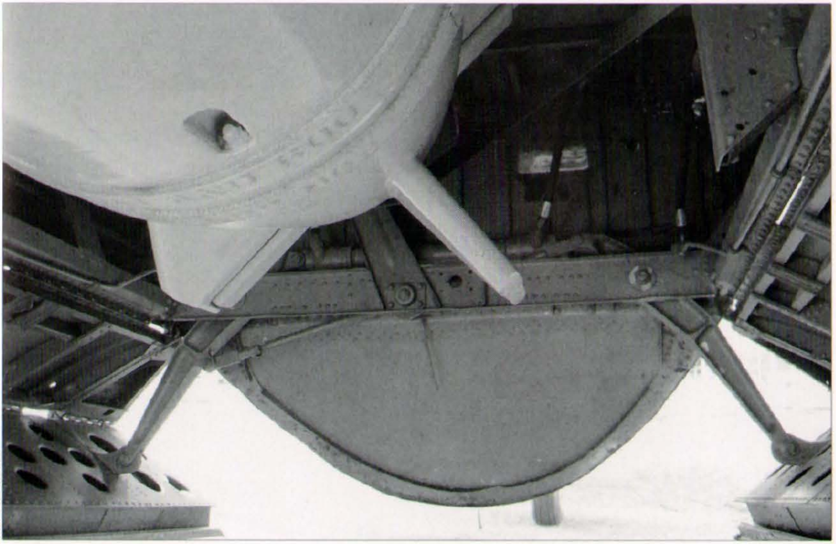
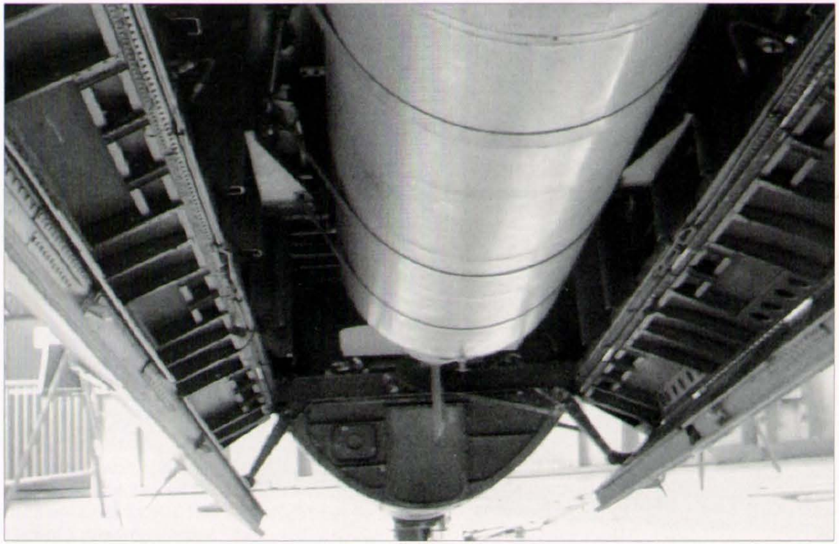




The interior of the bomb bay with a dummy Bliss-Leavitt Mk 13 torpedo shackled up. Beside bombs and torpedoes, the bomb bay could accommodate auxiliary fuel tanks of 1022.1 litre (for ferry flights) or 802.5 litre (self-sealing, for reconnaissance sorties). The latter type extended the range of the aircraft to 2333.5 km. Both types could be dropped in emergency • Wnętrze komory bombowej z podczepioną atrapą torpedy typu Bliss-Leavitt Mk 13





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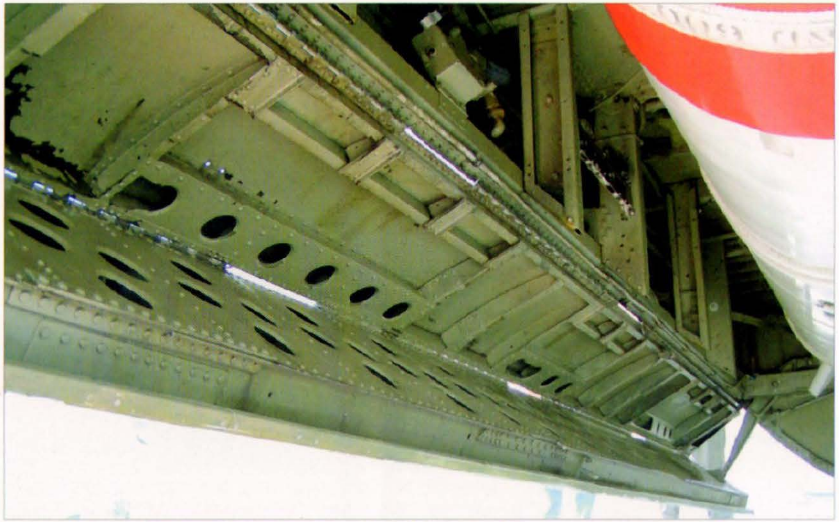
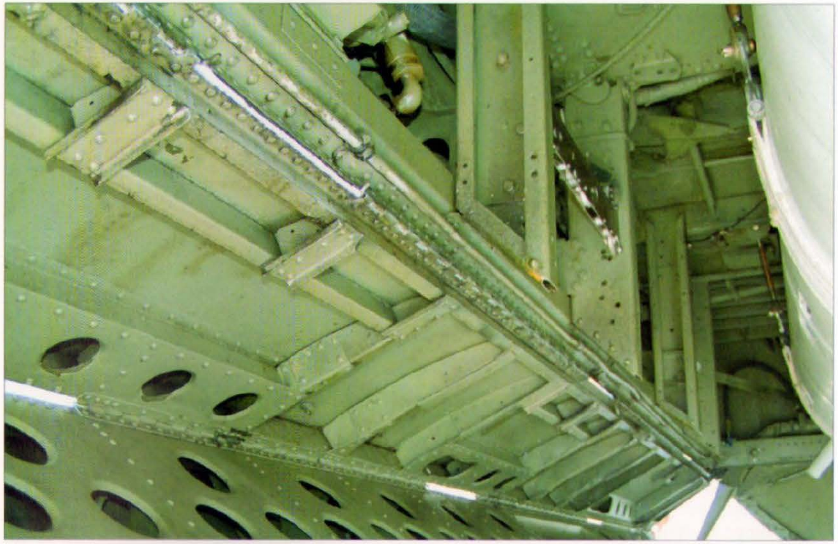
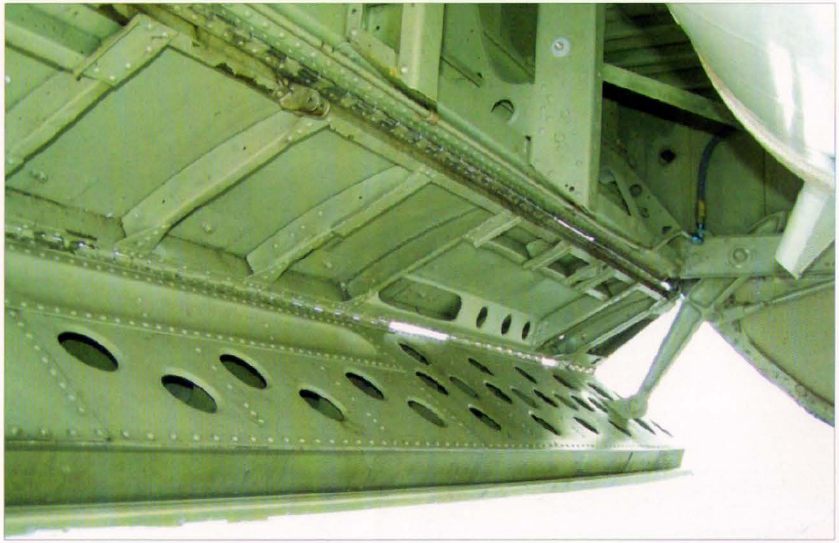
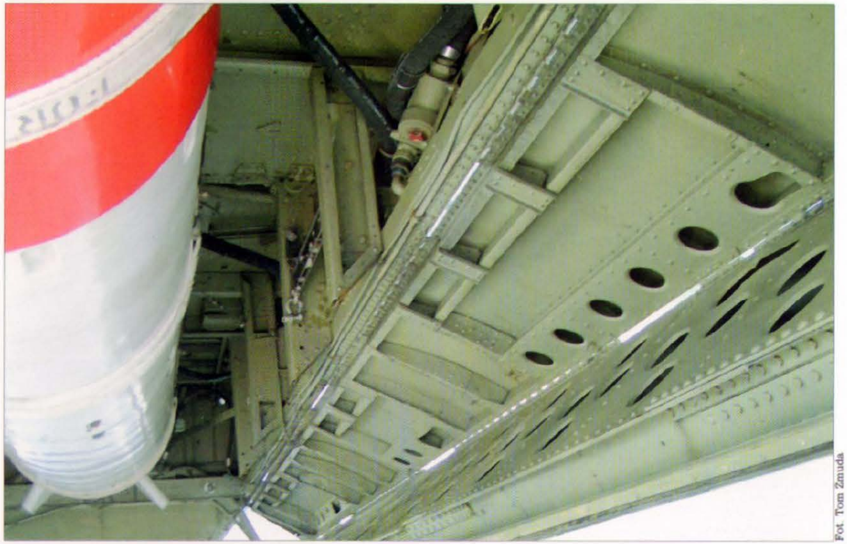


The inside of the bomb bay doors • Drzwi komory bombowej od wewnątrz







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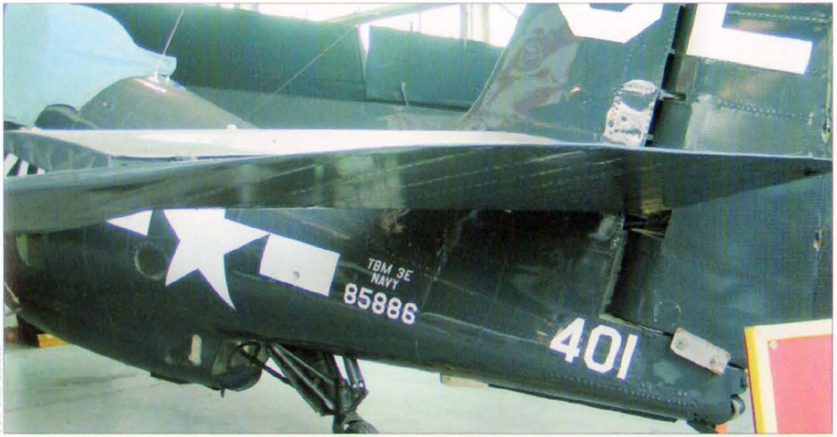

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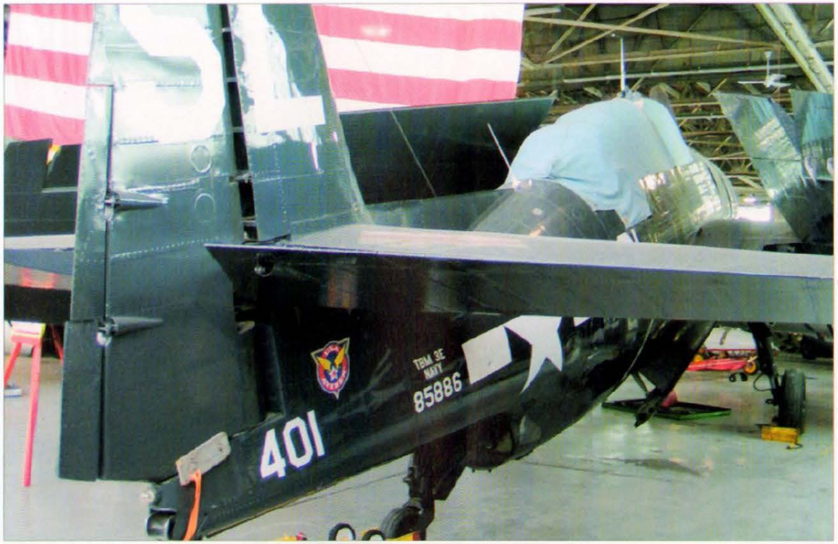
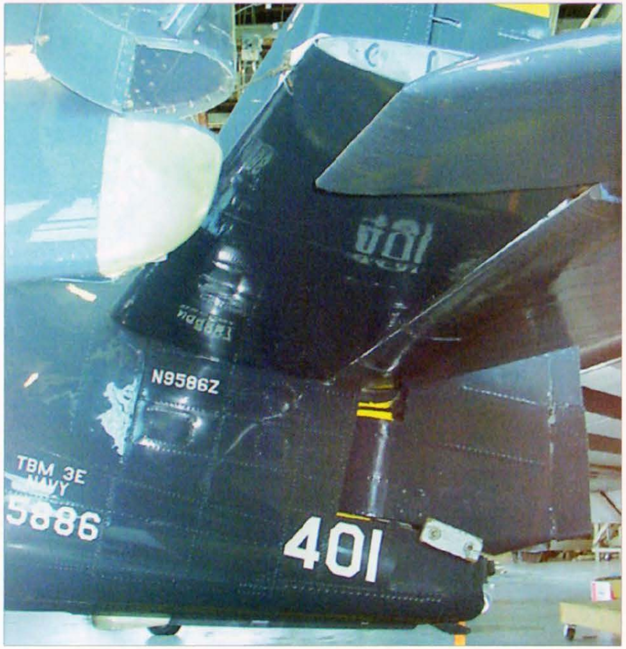
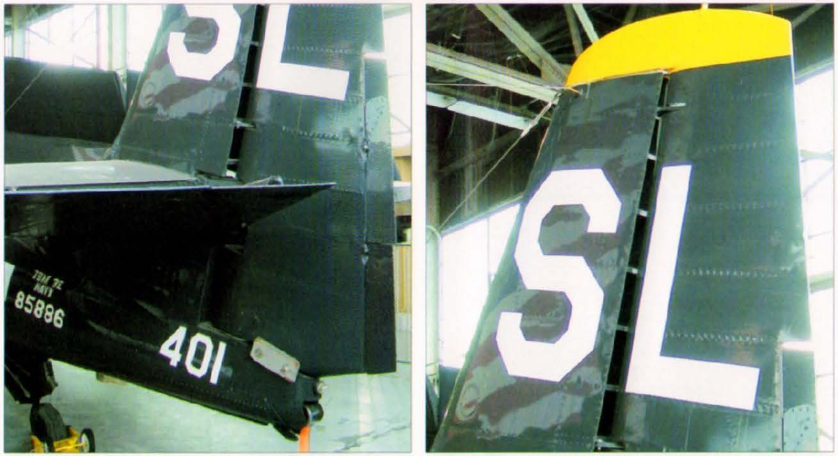
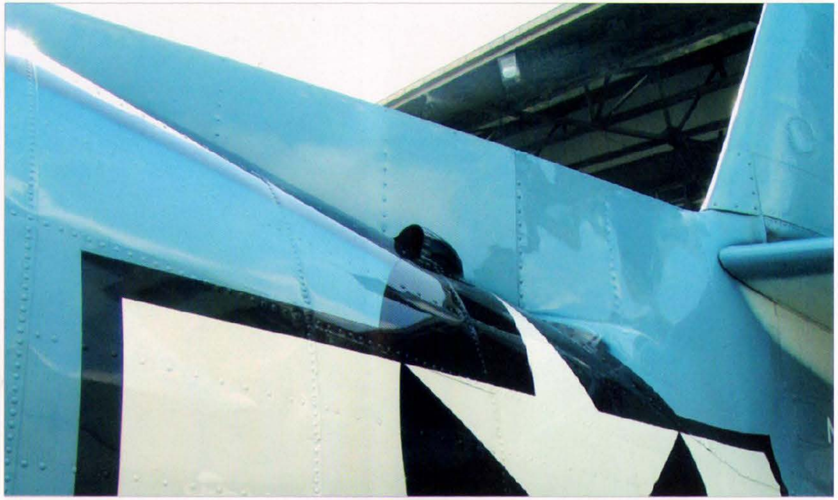




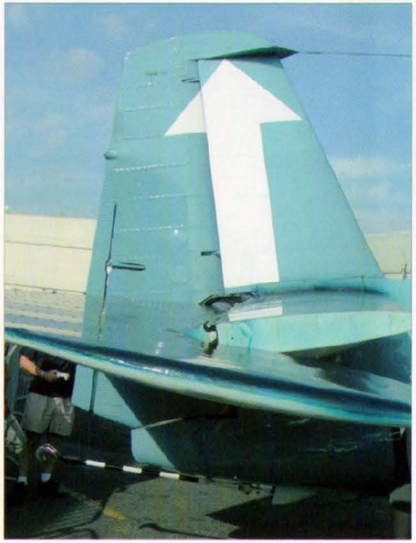
The end part of the fuselage and the tail of the museum TBM-3E. The control surfaces were made of metal and covered with fabric • Końcówka kadłuba i usterzenie muzealnego TBM-3E

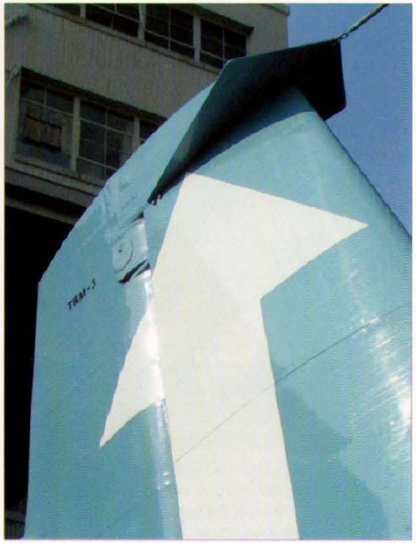


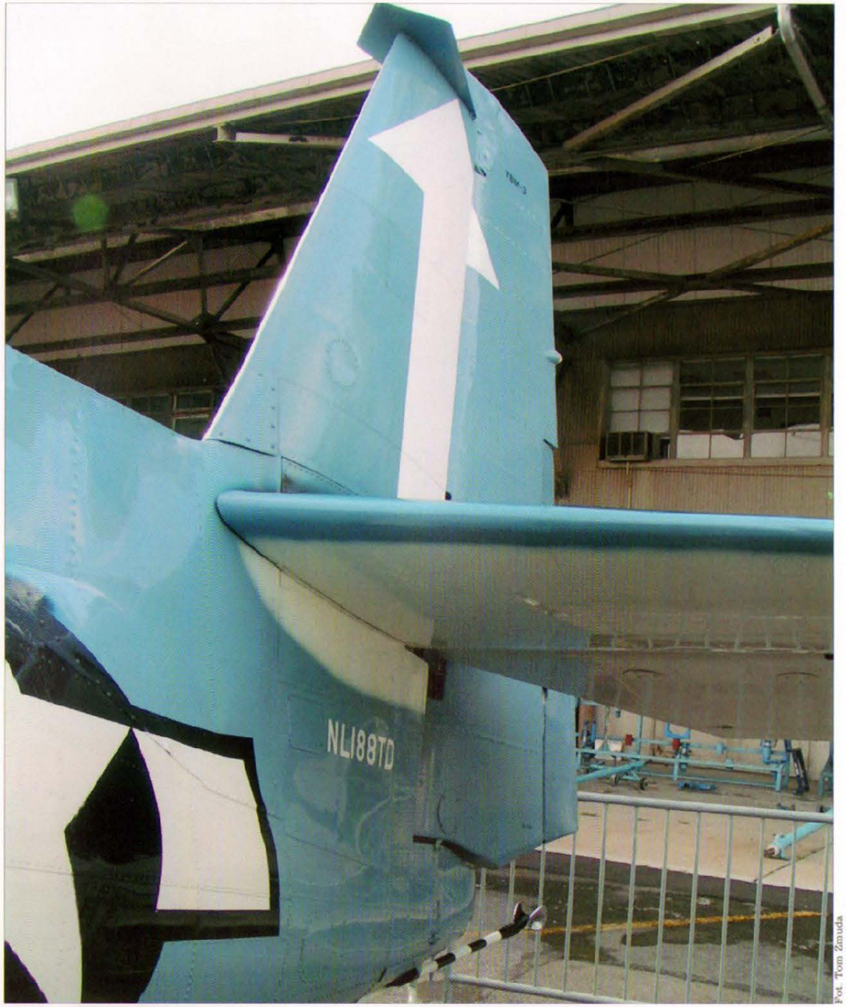
The tailfin and the rudder, both sides. Note the upper trim tab and the lower balance tab, as well as the tail white navigation light (between the arrestor hook and the rudder). The rudder could move left and right up to the angle of 24 degrees • Usterzenie pionowe z lewej i prawej strony



The dorsal stabilizing fin. Note the fuselage ventilation air intake • Płetwa ustateczniająca na kadłubie







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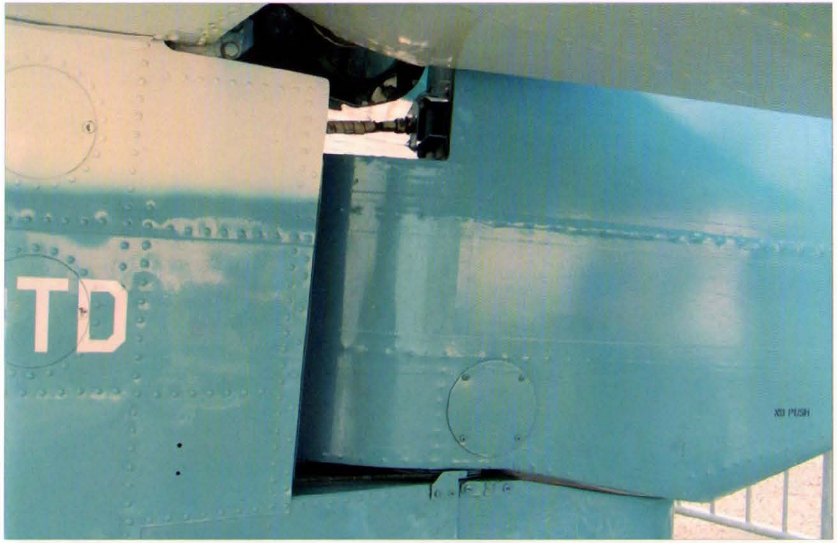
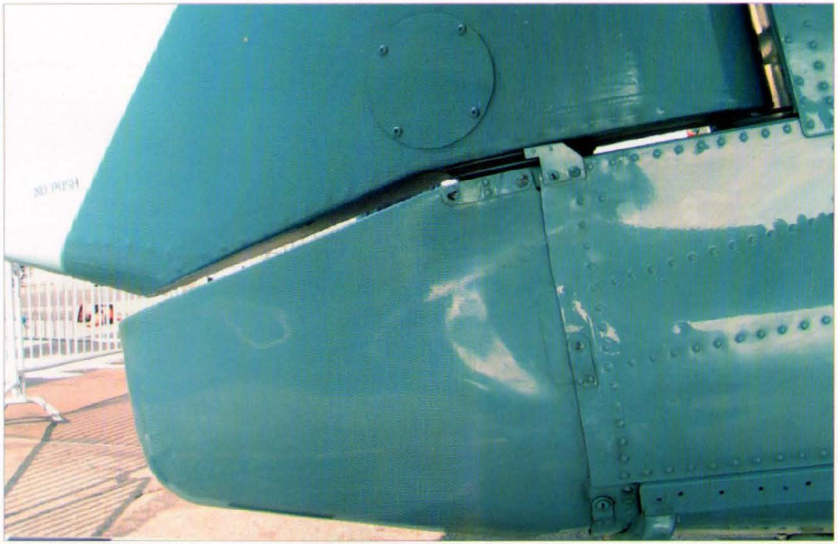
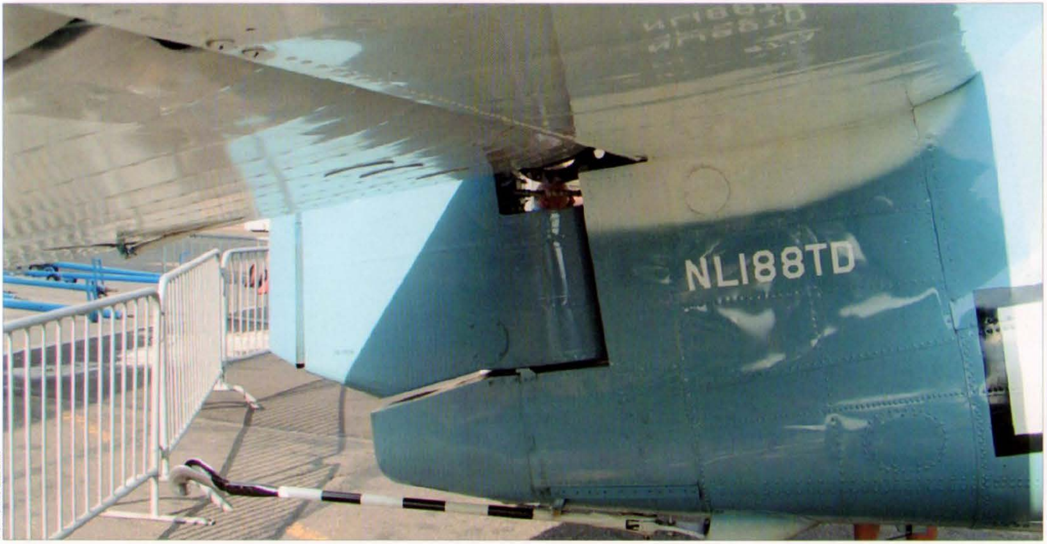
The tailfin and the rudder of the museum TBM-3E. Originally the radio aerial was fixed to a short radio mast on top of the tail fin, whereas there was no diamond-shaped plate as seen in the photo. The white navigation light was located on the trailing edge of the tail • Usterzenie pionowe TBM-3E







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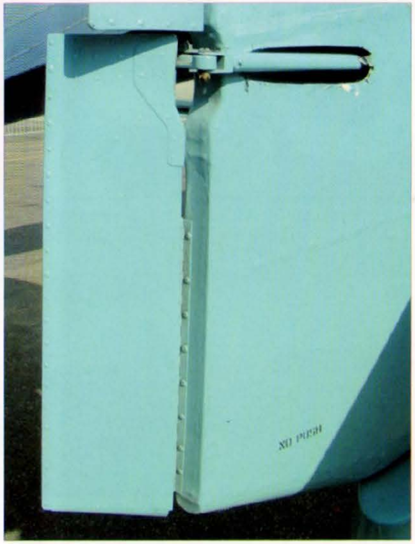
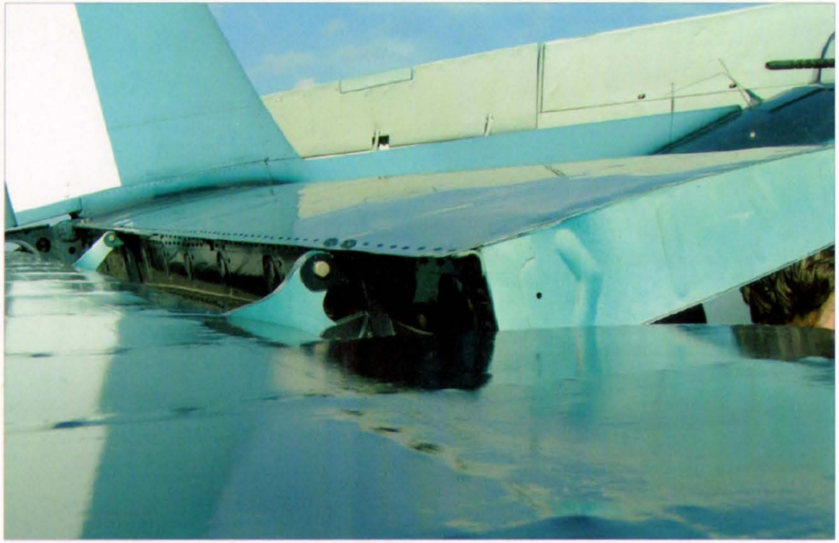
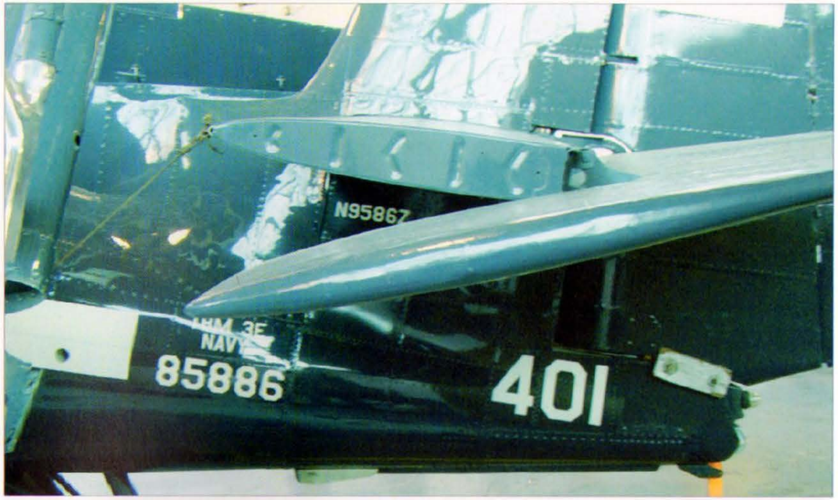
The end tip of the fuselage and the lower part of the rudder. Also visible is the external arrestor hook, typical of the late TBM-3Es • Końcówka kadłuba i dolna część steru kierunku

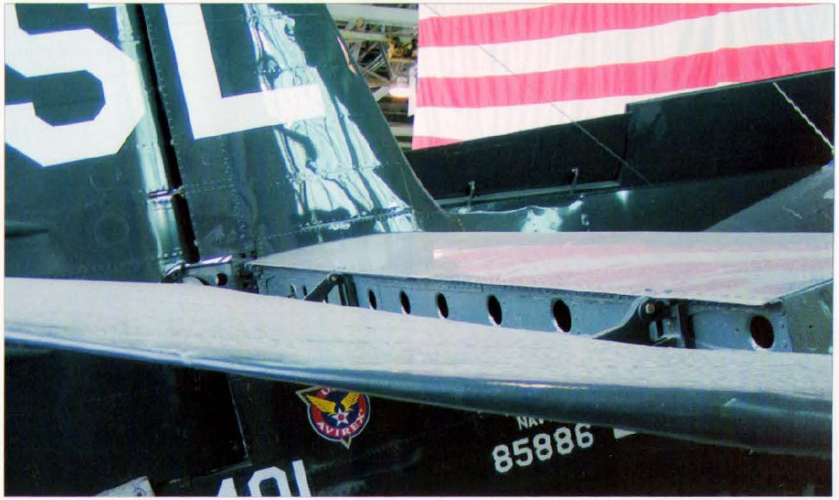
The balance tab of the rudder and its control linkage • Klapka odciążająca steru kierunku i dźwignia jej napędu



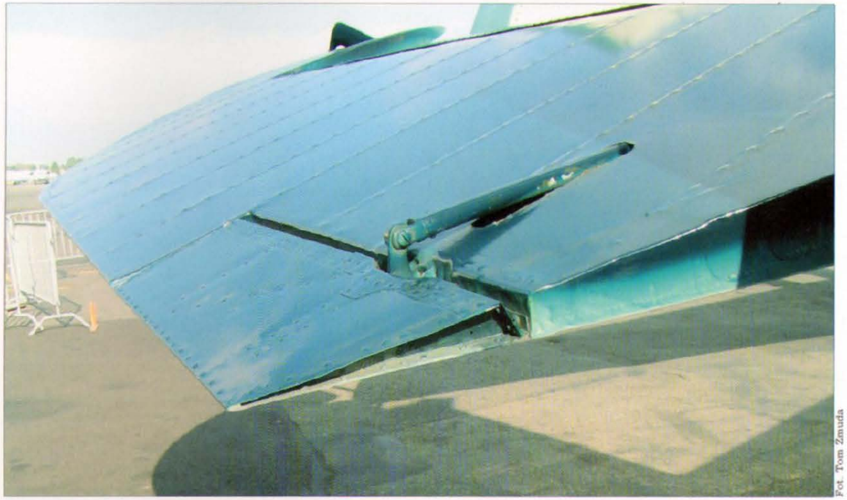




The tailplane with the elevator deflected up. Note the outermost solid rib of the tailplane. The arrestor hook is stored inside the fuselage end tip • Statecznik poziomy ze sterem wysokości



The tailplane with the elevator trimmed up. The elevator was fastened by two hinges and could move up and down by -10/+20 degrees • Statecznik poziomy ze sterem wysokości



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Port elevator with the trim tab and the tab control linkage • Lewy ster wysokości z klapką wyważającą i dźwignią jej napędu

TOPSHOTS

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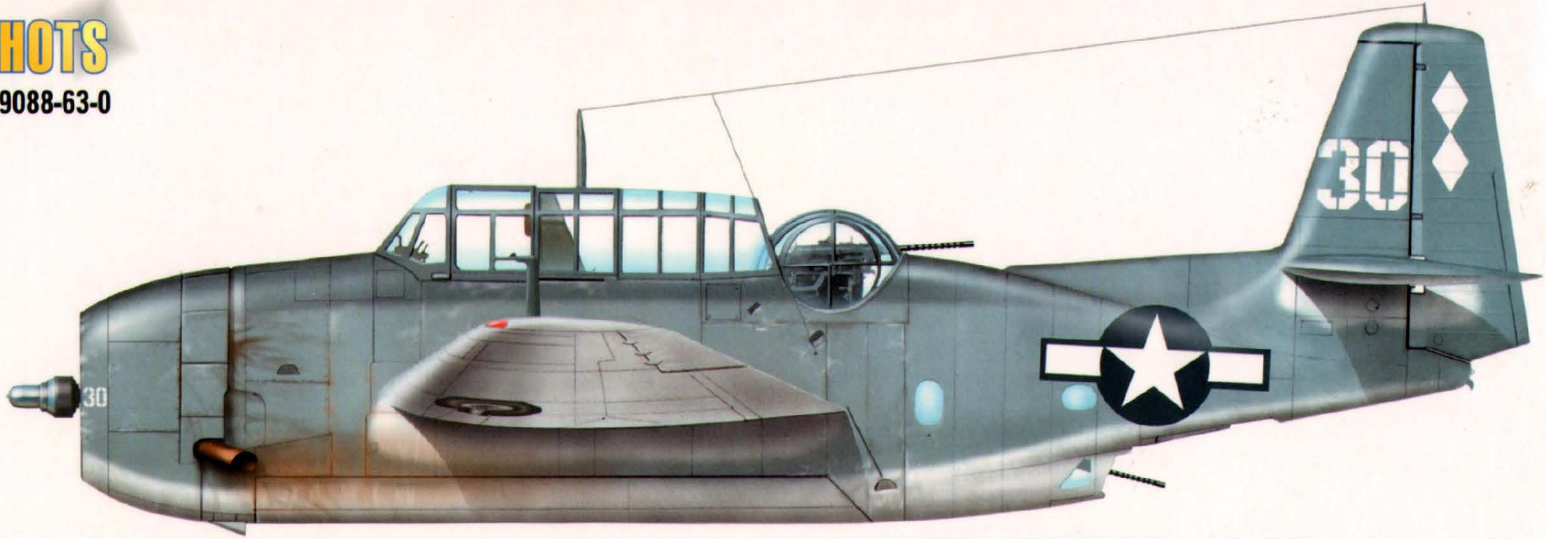
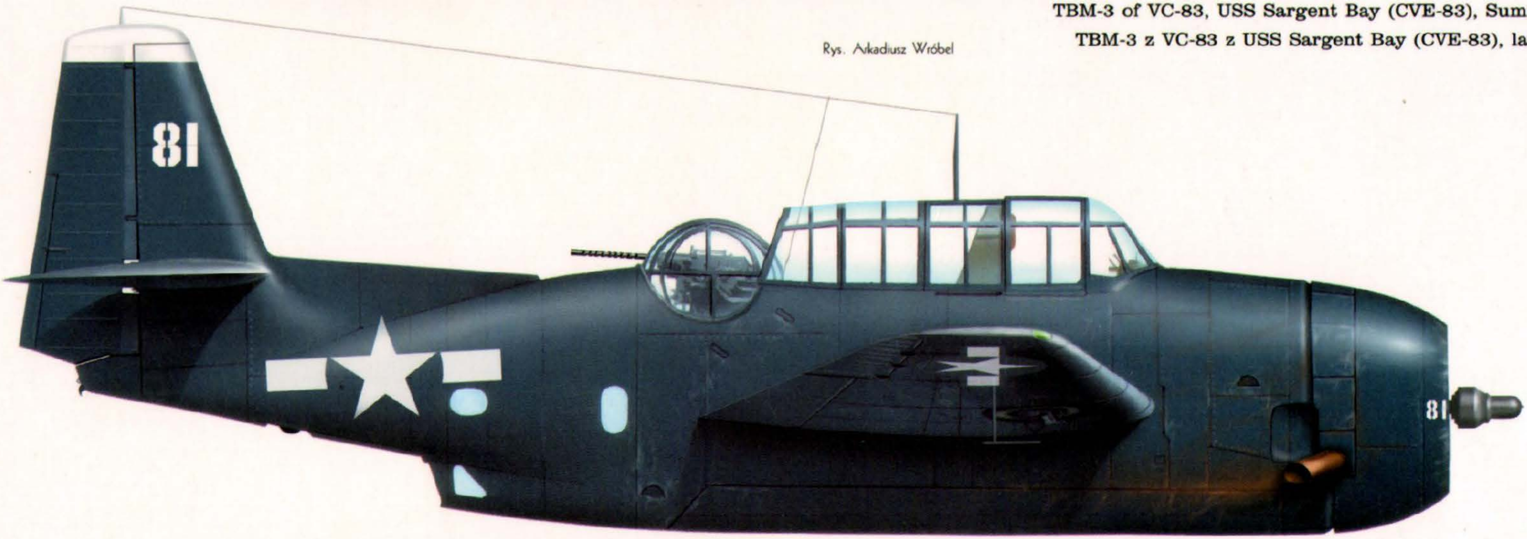


TBM-3 of VC-83, USS Sargent Bay (CVE-83), Summer of 1945
TBM-3 z VC-83 z USS Sargent Bay (CVE-83), lato 1945 r.

Rys. Arkadiusz Wróbel



TBM-3 of VC-9 from USS Nato Mabay carrier (CVE-62), Summer of 1945
TBM-3 z VC-9 z lotniskowca USS Nato Mabay (CVE-62), lato 1945 r.